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Circuit Earth-Fault Protection

Guarding Against Fire Risk

AS installations grow in size, the design of control and protective gear has been steadily improved to enable it to break with safety the correspondingly heavier currents. The same attention has not been paid to another aspect of the problem, neglect of which may involve consequences quite as serious as those due to inadequacy of circuit-breakers or fuses.

The aspect we have in mind is the need to relate the settings of the circuit-breakers or fuses to the resistance of the earth return circuit. Attention was drawn to this need in Electrical Accidents (the Factory Department's annual publication) for 1937, in which it was pointed out that upon this relationship depends the efficacy of protective appliances in dealing with faults to earth. Leaving out of account the resistance of the fault itself (which cannot, of course, be estimated in advance), wherever the resistance of the earth return path is too high to pass enough current to blow the circuit fuse, the leakage will persist, resulting in a risk of fire or shock.

Fuses Ineffective

It is more than suspected that a large proportion of such fires as are really due to electricity owe their origin to this point not being appreciated. The direct reason for this attitude is, no doubt, that evidence as to the cause is usually destroyed in the fire. Evidence of a kind that is likely to stimulate action is, therefore, rarely available but, at the recent E.C.A. Conference, Mr. A. J. McColgan (of the Electrical Branch of the Home Office) quoted some striking instances of earth currents which were sufficiently large to produce the heat necessary for igniting inflammable material, but which were yet not heavy enough to blow the circuit fuse. Further reference is made to this point in the annual report of the Chief Inspector of Factories reviewed in this issue.

His views are borne out by a case that came to our notice only a few weeks ago in which cause and effect were clearly related. This concerned an electrically heated school, the supply to which was controlled by a 200-A ironclad switch with its blades mounted on an insulated operating bar. One of the blade clamps working loose caused abrasion of the micanite, resulting in an earth on the incoming side of the switch. The only protection afforded was by the 500-A fuses at the supply undertaking's substation at some distance from the school. These failed to blow and a fire broke out which was extinguished by the fire brigade.

The measured resistance of the complete earth return path was 1.04 ohms (of which the resistance between the installation metal work and the water pipe in the school accounted for 0.9 ohm) so that the maximum fault current at 230 V was 240 A and the 7/0.064 SWG earthing conductor melted. It will be observed that the earth resistance was only of the order of that prescribed as a maximum in the I.E.E. Regulations and that a leakage-trip on the installation side of the switch would not have helped matters.

Drawback of Lower Voltages

Actually there was no trip switch in the case under mention and there are other situations, *i.e.*, those requiring flame-proof apparatus, in which the use of such a device would be impermissible, as even the 40-V rise in potential allowed under the I.E.E. Regulations, though preventing appreciable shock, might result in open sparking. It is possible, indeed, that in the care that is being devoted to shock prevention, the fire hazard is sometimes lost sight of. Thus the use of lower voltages which is advocated in some quarters would make it more difficult to secure proper protection against earth leakage, owing to the higher fuse ratings necessitated by the heavier load currents.

Although the desirability of periodical tests of insulation resistance is generally accepted, there is not the same general recognition that the consumer's earth resistance is in just as much need of checking, largely, no doubt, because instruments for making easy and reasonably accurate measurements of earth resistance are a comparatively recent introduction.

While there are sufficient records available nowadays to show how small a proportion of fires is due to electricity, it is a truism that conditions are becoming increasingly severe. There appears to be some risk that the advantages of improved insulation and installation methods in preventing fires may be thrown away in a disregard of the effect of earth-leakage currents which are not large enough to blow the fuse but which are, nevertheless, able to cause serious overheating of the earth connections.

Glasgow and E.D.A.

A FEW weeks ago we appealed to the Glasgow Corporation to give further consideration to the matter before finally deciding to withdraw from membership of the British Electrical Development Association. Last week Mr. V. W. Dale, E.D.A.'s business manager, interviewed the Electricity Committee and as a result it was decided that the current year's subscription should be paid, it being left to the new Committee which will be appointed in November to say whether membership should be continued after this year. So far so good; but the problem is merely shelved. It is evident, however, that the Committee has a feeling that, after all, membership of E.D.A. is not entirely a waste of money and we hope that the new Committee will come to the conclusion that it is money well invested.

Emergency Stoppages

UNDER the new Factory Act means must be provided to cut off in emergency the driving power from shafting. Where electric motors are used this can easily be done from convenient control points. Attention is drawn in the annual Report of the Chief Inspector of Factories to the need for devising a suitable remote control system for internal combustion engines, but surely the proper solution is that where such engines are used they shall drive generators supplying electric motors that can be stopped individually, thus promoting safety and at the same time obviating the need to bring the whole works to a standstill.

Motor Speeds

THE third of the articles produced as a result of our exhaustive survey of the electric motor industry, which appears in this issue, deals with the all-important subject of speed. The requirements for various applications are considered and the type of motor suitable for particular cases is suggested. Control methods and the design of variable-speed machines also receive attention. The next article, to be published next week, covers the subject of motor enclosures and ventilation. It involves the consideration of a number of industries in which motors are called upon to operate industry or explosive surroundings and quotes the opinions of a number of manufacturers upon the effect of the type of enclosure upon the rating of the machine.

Bread Baking Costs

FIGURES obtained in Switzerland with the heat accumulator type of electric oven (reported in this issue) compare unfavourably with those that have been achieved in this country. They are, however, good enough to show that in any case the over-all running costs of baking bear little relationship to the calorific values and prices of electricity or other fuel. The important point is the percentage that cost of power bears to the total cost of baking a definite weight of bread, taking into account savings in maintenance, labour, fuel storage and dough. The electrical case is sound enough from this point of view, quite apart from its more obvious advantages in cleanliness, flexibility and close control of temperature.

Radiolympia

THE fourteenth National Radio Exhibition opened at Olympia on Wednesday, and will continue until Saturday, September 2nd. Incidentally, it is claimed to have been the first public function in the world to be opened by television. The opening speeches by Sir Stephen Tallents and Mr. J. H. Thomas (chairman of the Radio Manufacturers' Association) were televised from Alexandra Palace, and received on some three hundred television sets which are working at the Exhibition. For the first time the Services are prominent at the show, their exhibits revealing the extent to which radio enters into their activities to-day. The Admiralty, the Army and the Royal Air Force all have displays, while other Government Departments represented are the General Post Office, the Ministry of Labour and the Department of Overseas Trade. The show promises to be one of the most successful ever held, for this year there is something to suit all tastes. Apart from the actual radio manufacturers' exhibits, there is a model factory and many technical displays to interest the radio or electrically minded visitor. For the non-technical members of the public the large theatre, the television reception, a cinema and other features are provided. The whole show is intended to bring home to the radio listener that if he is using an old receiver he is missing the best that radio can provide, and that the 1939-40 radio receivers on view are better value than ever before. In addition, those visitors living within the service area of the television transmitter at Alexandra Palace will be shown in no uncertain manner the advantages of being a televiewer as well and this should lead to many converts.

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September Events

AFTER the Radio Exhibition closes next week functions of electrical interest follow in fairly quick succession. The following week the Association of Public Lighting Engineers is holding its annual conference at Glasgow. A topic which is sure to be much discussed at this year's meeting is compliance with A.R.P. requirements, and in particular means for centrally controlling street-lighting systems. As in previous years, there will be demonstrations of the latest types of lighting equipment, in which a number of improvements in lantern construction will be noted. From September 14th to 30th the Engineering and Marine Exhibition, a biennial event, is being held at Olympia, and on September 15th the I.E.E. Transmission Section's summer visit to Yorkshire takes place. During the next week (September 21st to 23rd) the eleventh annual conference of the National Smoke Abatement Society is to take place at Blackpool.

E.T.U. Jubilee

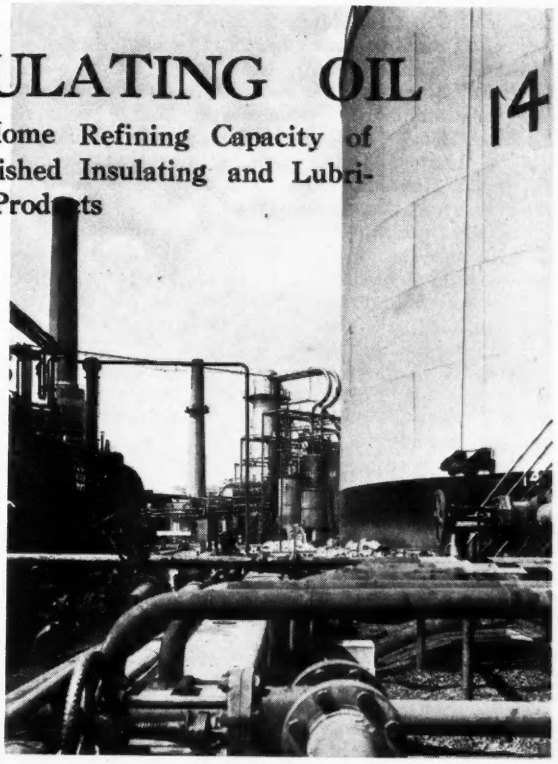
THE Electrical Trades Union celebrated its golden jubilee last week and can thus claim to be the oldest organisation in the electrical industry with the exception of the I.E.E. The next oldest, the I.M.E.A., had its origin in 1895—six years later—and most of the others were formed after the beginning of this century. Its early history was a struggle to raise the skilled electrician's conditions above those of the unskilled labourer. The original members were, of course, preponderantly telephone men, but the acquisition of the system by the G.P.O., with the formation of a separate union, brought about the change to the present make-up of the E.T.U. Naturally, the Union has been involved in many disputes, but it can unquestionably maintain that it has regularised the workers' side of the electricity supply and contracting industries, thereby raising the standard of workmanship and the status of an important craft. It can also claim, in the words of its general secretary in his article published in our May 26th issue, "that through its activities it has played a useful and honourable part in the development of the electrical industry."

ENGLISH INSULATING OIL

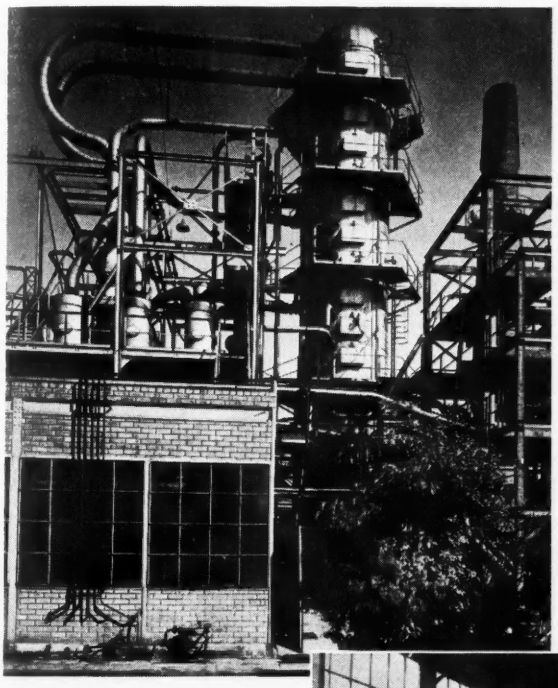
An Addition to Britain's Home Refining Capacity of 140,000 Tons Yearly of Finished Insulating and Lubricating Products

SOMETHING like 65 per cent. of the transformer insulating oil utilised in Britain, together with 40 per cent. of home-used lubricants, are said to be consumed within a radius of 100 miles of Trafford Park. This is but one of several equally good reasons why the Manchester Oil Refinery, Ltd., was established at Barton near to the Municipal Corporation's electricity generating station. They are separated only by the Bridgwater Canal on the one side, while on the other the Manchester Ship Canal affords direct access to ocean tankers.

The Manchester company enjoys the benefit of the experience of its managing director in the construction and running of two most successful Continental refineries. Its policy is to act independently in the production yearly of 20,000 tons of lubricating, electrical insulating and pharmaceutical white oils of the solvent treated and dewaxed higher grades, together with 35,000 tons of conventionally acid-treated lubricants; 60,000 tons of such by-products as kerosene, gas oil, various Diesel and fuel oils, axle oil, dark cylinder stock and printing ink oil; 15,000 tons of bitumen suitable for insulating purposes, road building, or the manufacture of paints, roof felts, etc.; 4,000 tons of paraffin waxes and possibly a small proportion of petroleum jelly.



Part of the Manchester oil refinery, showing one of the Barton power house chimneys on left

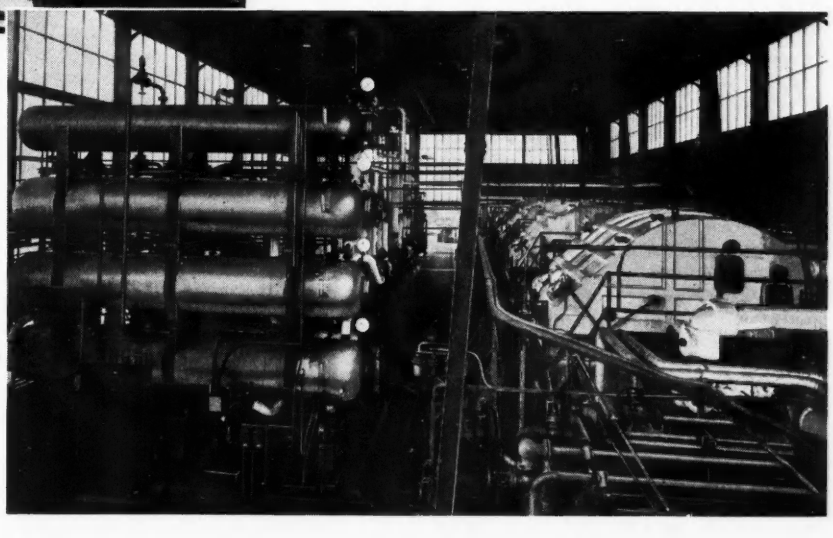


Single flash fractionating column, 60 ft. in height, for high-vacuum distillation of crude oil

Construction of the plant at Barton started early in 1937, Moore & George, Ltd., acting as the consultants. A considerable amount of welding work was done by the Whessoe Foundry and Engineering Co., Ltd., of Darlington, and Babcock & Wilcox, Ltd. Electrodes have been supplied by Murex Welding Processes, Ltd., and AC transportable 300-A arc-welding equipment and switchgear by the English Electric Co., Ltd.

Electricity is employed mainly for driving compressors and pumps of many types and sizes. All the Lancashire Dynamo and Crypto motors are of the explosion-proof class, and the majority of the Allen West controllers are of the automatic contactor type, actuated remotely by Buxton certified flameproof push-button switches. In addition, a number of drum controllers, resistances and oil-immersed circuit breakers are installed. A feature of the type "S.C.E." starter is that magnetic overload releases with adjustable oil dashpot time lags are provided on all three phases.

Cables were supplied by Johnson & Phillips, Ltd.,



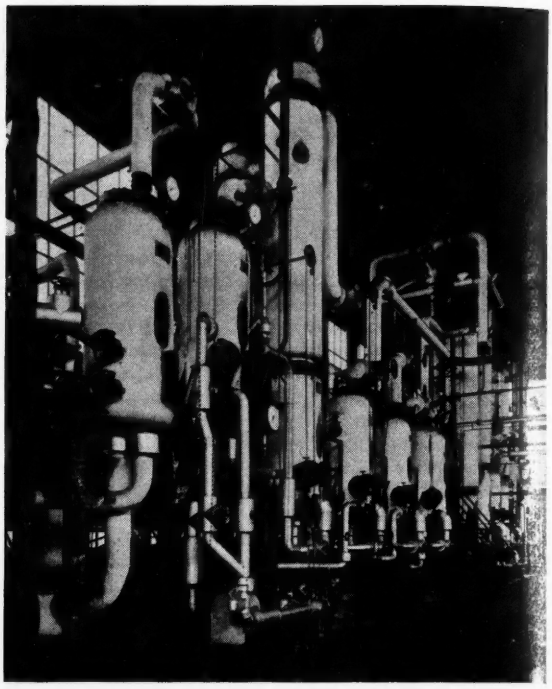
Edeleanu refining plant, showing rotary filter dewaxing machine drums on right

transformers by the Metropolitan-Vickers Electrical Co., Ltd., instruments and meters by Siemens-Schuckert (Great Britain), Ltd., and various other electrical fittings by Downes & Davies (Manchester), while the illumination scheme was prepared by Veritys, Ltd., employing "Maxlume" fittings and "Philora" (Philips Lamps, Ltd.) mercury discharge lamps, mounted on the side walls as well as overhead on account of the network of pipes.

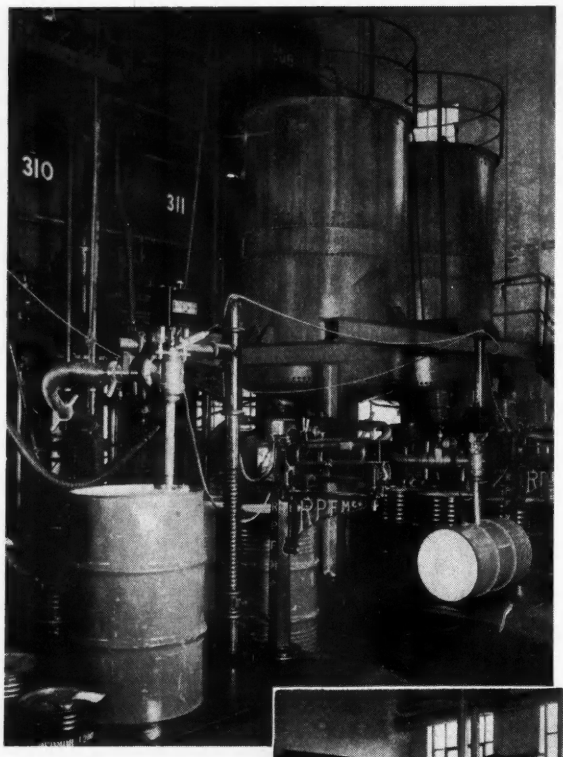
Natural American Gulf mineral crudes containing a little gasoline (petrol) or "topped" (removal of the more volatile element) to comply with the Ship Canal regulations, which do not permit the transport in large vessels of any substance with a flash point below 73° F., are shipped in what the trade calls "dirty" tankers. A standard cargo of 2.5 million gallons can be pumped ashore into storage tanks in two days, and can be "worked" right through the refinery plant in less than a month.

The refinery process commences with distillation. The crude oil is preheated by being pumped through heat-exchangers and afterwards by convection and radiation in an oil-fired tube still, whence it is "flashed" directly into the fractionating column, 60 ft. high, the high vacuum in which enables evaporation to take place below decomposition temperature, and the vapours surging upward separate themselves in the presence of process steam, according to boiling points, at differing levels up the tower. This step-wise condensation enables several distinctly identifiable fractions to be taken-off in side-streams, each at its respective level, through an external super-heated steam stripper, heat-exchanger and cooler. The stripping steam and light vapours are vented back to the tower and the residue pumped away from the base through a heat exchanger.

The capacity of this section of the plant is 150,000 tons per annum. It was designed by Foster Wheeler, Ltd., and constructed by Rheinmetall-Borsig A.G. for throughputs as high as 2,700 barrels per day.



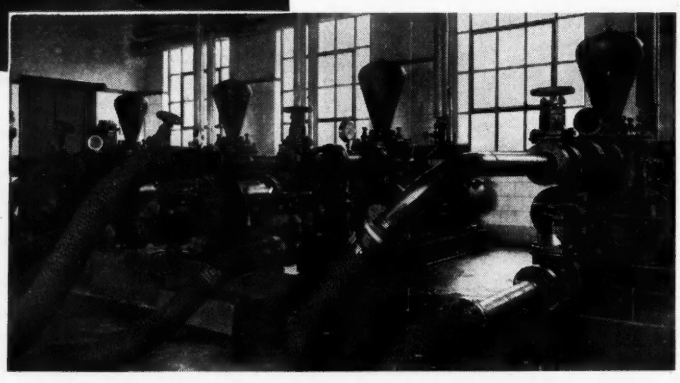
Unconventional solvent extraction section of the refining equipment



Electrically controlled weighbridge for filling drums in blending house, avoiding dribbling for net weight

The distillates thus obtained are "finished off" in two ways. The primary Edeleanu process consists in the combined use of benzol and sulphur dioxide to act both as selective solvents and as dewaxing mediums. The use of the same chemicals for both operations is an innovation that avoids the necessity for separation, while other technical features permit the working conditions to be modified so as to enlarge the scope of the plant, the yearly capacity of which is 40,000 tons.

The alternative method is a secondary process of refinement which is reserved for medium quality lubricating oils whose commercial value and "base" (chemical structure) warrant only the standard sulphuric acid washing to eliminate sludge-forming constituents, followed by absorbent clay neutralising and press-filtering. But at Barton this so-called "conventional" treatment is unusual by reason of the system being continuous, the sludge being centrifugally separated by a battery of Alfa-Laval acid-resisting machines.



Part of the heavy oil pumping equipment

Ancillary sections include clarifying and blending systems, with means of heating the oil up to 250° F. before it is "flashed" in a high-vacuum drum to remove the last traces of moisture that escape through previous process-drying stages. The cask- and drum-filling machinery supplied by Roberts Patent Filling Machinery Co. (Bolton) is fitted with electrically controlled valve mechanism, which saves time by obviating any need for dribbling devices to ensure correct net weights.

By materially enlarging Britain's capacity for home

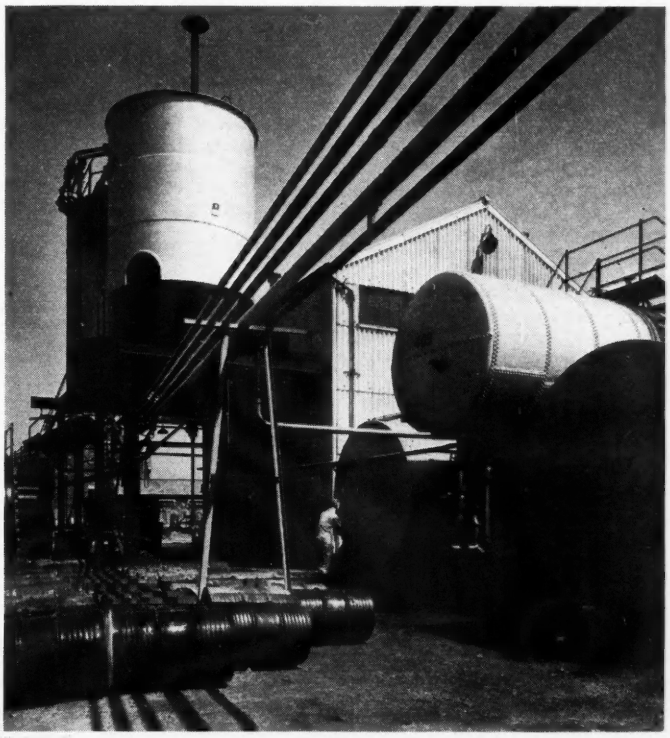
refinement, wholly from the crude to the finished products, the Manchester plant not only reduces the need for reliance very largely on foreign distillates conventionally treated abroad, but also constitutes a fresh potential source of domestically produced oils for special requirements.

This particular aspect is of especial significance to the electrical industry for it means that there is now available in this country a source of transformer and switch oils which is claimed to be capable of supplying all the requirements.

Moreover, the "Tramor" brand marketed by British Transformer Oil & Lubricants, Ltd., is said to possess that attribute, alone attainable by the selectivity of solvent refining, known as "low acidity development" after oxidation (sludging), which is becoming recognised as a basic factor in assessing the qualities of transformer and insulating oil.

While the B.S.I. has established limits of tolerance with respect to most essentials, it has not specified any tolerable acid value after oxidation, the attendant risk being that some buyers may be attracted by low sludge figures without realising that they can be arrived at by overtreatment in refining, the consequence of which may be acid development in ageing.

"Tramor" oils are made in both "A" and "B" grades to comply with B.S.S. 148-1933. Most grades are produced without the application of acid; others need relatively slight washing, so that subsequent neutralisation minimises the risk of sulphurous compounds of hydrocarbons remaining in the oil, not always apparent when new, but tending to cause acidity during use. Their viscosity is less than two-thirds of the average and their specific gravity is also lower, both of which factors facilitate circulation within a transformer and so keep down its working temperature. Loss by evaporation, too, is only about one-third of the average, which means that these oils should have a longer useful life and should diminish any possible fire risk, by reason of the relatively smaller amount of hydrocarbons given off, which, while evaporating, are to some extent inflammable.

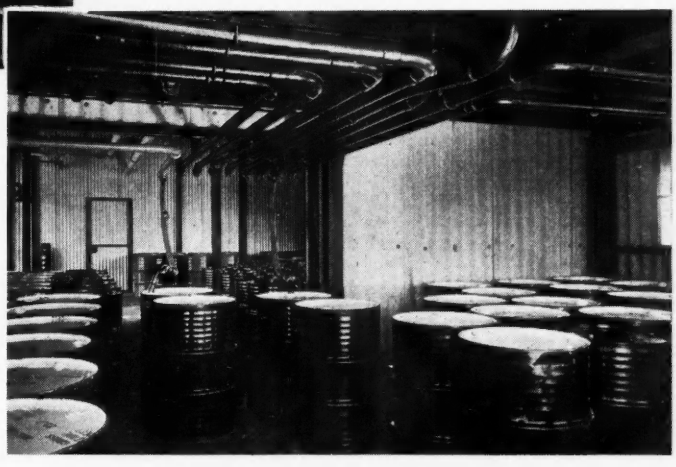


View of transformer and white oils final purification and drying treatment section of the refinery

The establishment in England of modern plant which is declared to be capable of furnishing nearly the whole of the British requirements for transformer oil, which are estimated to be of the order of 12,000 tons yearly, must surely be an asset. Coupled with which is the further economic aspect of the possibility of avoiding the import of wholly or half-refined foreign distillates, hitherto representing 95 per cent. of this country's demand.

This importation of distillates is replaced by the utilisation of various types of crudes. The plant at Barton, in spite of this flexibility in the production of consistent, high-grade oils, has assured itself of a uniform and continuous crude supply, and it must be a comforting thought to electrical manufacturers and engineers to know that the whole processes of the production can be personally inspected and followed through, at any hour of the day or night, at the company's factory at Manchester.

Loading spirit into road transport vehicles



Part of the blending house

Organisations of the Industry—XVIII

The A.O.E.C.

By E. J. Gibbons, Secretary

THE Association of Officers and Staff Members of Electricity (Power and Supply) Companies of Great Britain, briefly called the A.O.E.C., was formed on January 20th, 1919, in consequence of the then recent report of a Committee appointed by the Board of Trade to enquire into the question of the supply of electricity throughout the country. Its object was, and is, to protect the interests of its members in connection with any proposals affecting the electricity supply industry, and to do all such things as are incidental or conducive to the attainment of that object. Membership of the Association was originally open to all officers and staff members (both male and female) of electricity (power and supply) companies of Great Britain with a service of ten years in the industry (not necessarily with the same undertaking). The qualification of ten years' service was subsequently reduced to five and, in 1938, to one year.

The Association is not a trade union, is non-political and does not in any way concern itself with conditions of service. That good feeling and co-operation exists between the Association and the management of so many companies is evidenced by the inclusion in the list of its members of the names of many gentlemen holding responsible positions in the industry, a number of whom have acted as presidents and vice-presidents and serve on its executive committee.

Above: Capt. J. M. Donaldson (president); Left: Mr. E. J. Gibbons (secretary); Right: Mr. J. J. Lesser (chairman of executive committee)

In a short history of the Association of this nature it is not possible to set forth in any detail a full account of its activities since its formation; but perhaps mention may be made of the following in order to bring before the reader's mind the work done by an association of this character. The Association was primarily responsible for the insertion of Clause 16 in the Electricity (Supply) Act, 1919, and for the amendments inserted in subsequent legislation, which provide for the payment of compensation to employees of companies prejudicially affected in consequence of the passing of those Acts. Section 16 of the 1919 Act was the first section of its kind ever included in any Electricity Supply Act entitling employees of undertakings to compensation if their interests were adversely affected by the operation of the Act.

Constant Watch

It must be remembered that a right or privilege obtained under any Act of Parliament may be prejudiced or lost under a new or amending Act. Public Bills and Private Bills promoted to ensure reciprocal working and other arrangements between authorities and persons often contain provisions which might either modify or annul the rights secured by existing legislation. In order to ensure that those rights, obtained after so much effort, labour and expense shall not be lost, it is necessary to consider carefully every Bill that is introduced which may in any way affect the supply industry.

In the majority of cases it has been possible by amicable negotiation to secure the insertion in proposed legislation (public or private) of adequate protection for employees who may be adversely affected; but in several cases Bills have had to be opposed (sometimes in collaboration with other associations) with the result that protecting clauses have ultimately been included.

When the two Bills dealing with electricity supply in London were introduced in 1924 it was doubtful whether the operations contemplated under them would be covered by the section in the general Act of 1919. The Association therefore secured by agreement with the promoters of the London Electricity Supply (No. 2) Bill, the inclusion of a clause fully protecting the rights of its members. The promoters of the London Electricity Supply (No. 1) Bill, 1924, in the Bill's final form granted the insertion of a clause fully protective and similar to the one inserted in the other Bill. In this connection it may be mentioned that the Association worked in collaboration with the Electrical Power Engineers' Association.

The necessity for this watch on projected public and private legislation, which must be, and is being, continued, will be appreciated when it is realised that sometimes as many as sixty Bills containing some reference to matters affecting the electrical industry are deposited in a single Parliamentary session.

The Association, which is recognised by the Electricity Commissioners, has, with other organisations, been represented at conferences on matters affecting the industry and when considered expedient by its executive committee has taken concerted action with these other organisations to achieve its objects.

The first president of the Association was the late Sir Alexander B. W. Kennedy, F.R.S., who took office in 1920 and resigned owing to ill-health in 1928. Sir Alexander was followed by Capt. J. M. Donaldson, M.C., a Past-President of the I.E.E., who has now held the office for some nine years. The following well-known electrical men are vice-presidents: Mr. E. Boys (Northmet Co.); Mr. W. Fennell (Mid-Cheshire Co.); Mr. E. Harlow (City of London Co.); Brig.-Gen. R. F. Legge, C.B.E., D.S.O. (British Power & Light Corporation); Lt.-Col. S. E. Monkhouse (North-Eastern Co.); Mr. C. Parker (London Associated Electricity Undertakings); Mr. H. J. Randall (City of London Co.); and Mr. P. L. Riviere (Central London Co.).

The chairman of the executive committee is Mr. J. J. Lesser, of the City of London Co., and with him serving on the committee are Messrs. C. J. Barnett (Northmet), H. W. Cox (Central London), J. J. Gibbons (Northmet), H. Harris (City of London), F. Judge (City of London) treasurer, R. Litt (Central London), and J. Rankin (North Wales). The writer of this article recently succeeded Mr. H. S. Mayer who, owing to pressure of other work, had to resign the secretaryship of the Association.

Water-cooled Lamps for Television

THE task of providing television studios with twice the light now required by cinema studios without subjecting the occupants and contents to unbearable heat has been eased by the General Electric Co. of America at its television station at Schenectady, New York, by the use of a battery of four water-cooled quartz mercury-arc units containing twelve argon-filled lamps having a light output equivalent to that provided by nearly 30,000-W of incandescent light, at the same time giving off no appreciable amount of heat.

The lamps are about the size of a cigarette and have an exterior of quartz. Surrounding the tube is another quartz jacket through which water passes at the rate of three quarts a minute, dispersing 90 per cent. of the heat. The twelve 1,000-W lamps used have a total light output of 780,000 lumens, while the same wattage of incandescent lamps would provide only 330,000 lumens.

The possibility of a burn from incandescent lamps, caused by the infra-red radiation, greatly inconvenienced performers appearing before the television camera; in the case of the new lamps more than 90 per cent. of the infra-red radiation is absorbed in the circulating water. The cooling system of the lamps is equipped with a pressure-operated switch and magnetic valve, since the water in the jacket must be moving before the lamp is lighted and because the lamp must be turned off automatically in the event of failure or reduction of the water supply. During operation a pressure of more than 1,000 lb. per sq. in. is developed within the quartz jacket.

Motor Survey—III

Speed Control

Choice of Equipment to Meet Different Requirements

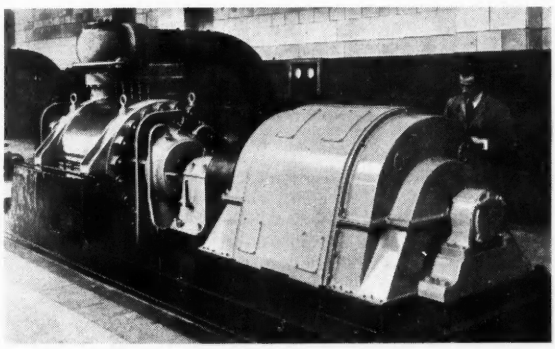
NO doubt the great majority of factory drives will always call for constant speed, for which the electric motor has long since won fame. This has a bearing on the simplicity of compounding the DC field for any requirement and the inherent constant-speed property of AC induction motors in that they are "tied" to the synchronous speeds.

In ease and accuracy of speed control alone the electric drive is superior to any of its rivals: the manufacturer can now cater for any reasonable variable speed requirements.

In discussing synchronous motors (Article II) we have already shown how readily applications requiring absolute 100 per cent. constant speed can be served. Similarly on the DC side precision accuracy of constant speed is given by Ward-Leonard control, and Mr. Mallet (Normand Electrical) said that this was the only way to afford absolute constant speed irrespective of load on the circuit. He cited the conveyor drive for pulverised fuel furnaces as an application of this.

Catering for high speeds is a specialised job and the driving of wood-working machinery comes to mind as an outstanding application. By means of frequency changers speeds higher than those of the 50-cycle range are afforded and the B.T.H. Co., told us that it had actually built machines for speeds as high as 60,000 RPM. Indeed, electrically there seems to be no limit; this is set at the moment by the bearings.

The universal or series characteristic motor is essentially a high-speed machine and in the smaller sizes it is particularly suitable for those applications in which the motor is tied to the load—vacuum cleaners and geared portable tools for instance. The Normand Electrical Co. said that universal motors could be wound for any speed above 2,000 RPM, and that the higher the speed the better the performance.

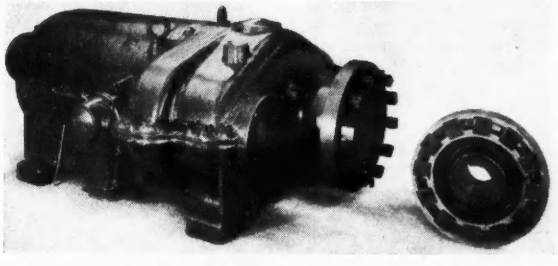


High-speed boiler-house feed-pump motors are available in really large sizes; a Lancashire Dynamo 1,100-HP, 1,475-RPM, 3,000-V motor driving a 1,263-gallon pump at Battersea power station

A high-speed application about which Crompton Parkinson told us is the testing of fuel pumps for Diesel engines. The speed range is very wide, the maximum being about 6,000 RPM. Special construction of the armature and commutator is called for.

A high-speed application in relationship to the heavy duty is represented by boiler-house pumps about which Lancashire Dynamo & Crypto, Ltd., told us something. It is experiencing demands for motors for such applications of up to 1,200 HP, direct-switching, single speed, 1,500 and 3,000 RPM.

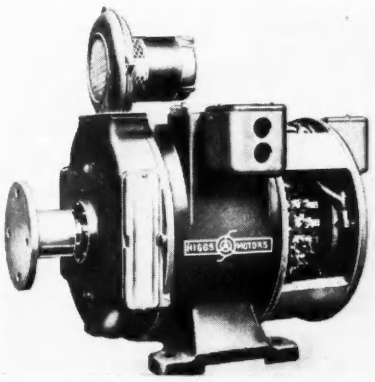
The smaller number of poles in the field dictated by the speed results in a long overhang of the windings and this calls for special bracing and supporting. Specially designed bearings are also necessary. Mr. Greenwood (Harland Engineering) told us of motors on scraper winches in the South African gold mines which had to run at four times their full speed when driven by the load. They must have a very high safety factor and are of all-steel construction.



The main idea underlying the larger geared motors is more efficient power transmission; Fuller Electrical helical double-reduction geared motor, 350-HP, 1,485/308 RPM, 400-V

Low-speed work is more often a question of power transmission and is largely linked with the development of the geared motor. Mr. Richards (Higgs) explained that with the large number of poles required for low speeds there was not the same opportunity for the manufacturer to make such sturdy construction and so below a certain speed—375 RPM (16 poles)—the gear box was added. With double reduction 9-RPM requirements are easily met.

Of the seven types of gear box adopted by the Normand Electrical Co., two serve for the normal speeds (up to 600-700 RPM) while the remainder afford very low speeds up to 16 RPM. A "general - purpose" unit em-



The new Higgs AC commutator motor with fixed brushes and an external regulator has an auxiliary winding which tends to eliminate sparking and one which further improves the power factor

ploying any suitable type of motor falls in the higher speed range and some of its applications are to lifts, shutters, conveyors, pumps, linotype machines and workshop cranes. The same unit on a pedestal with an external 9 to 1 reduction affords a speed range of about one-third to 10 RPM. Mounting the motor with a spur gear box provides a heavy power drive with speed limits of one-twentieth and 15 RPM.

With regard to larger motors, the Fuller Electrical Co. said that while the geared motor was a convenient way of tackling low-speed drives the underlying idea was more efficient power transmission, but there was still much prejudice against gears. The larger geared motor has a co-axial gear drive so that the stresses are evened up. Such motors are supplied particularly to the cement industry.

Self-contained electric hoists represent another application and worm gears are often adopted in this case. Stage lighting dimmers are a geared motor application catered for by Klaxon, Ltd. Constant speed and reverse switching are called for and a capacitor or repulsion-induction motor drives through a worm or spur gearing to give a final speed of about one RPM. Industrial instrument drives are another gear application catered for by this company with speed limits of about one and ten RPM.

The motor rotors are specially balanced dynamically and because the motors are so small the shaded-pole design is highly satisfactory.

Referring to the two-motor equipment for printing presses the G.E.C. said that the heavy starting torques and the steady low-speed running for "make-ready" purposes were obtained from a barring motor coupled to the main motor through reduction gear and an over-running clutch, the low running speed being about 3 to 4 per cent. of the maximum.

In the Normand shops we saw an interesting example of a low-speed non-geared motor. It was a 12-V, 500-RPM, DC unit for truck driving. Mr. Mill (B.T.H.) said that often the reason for adopting Ward-Leonard control was the ability to run down to crawling speeds with full-load torque.

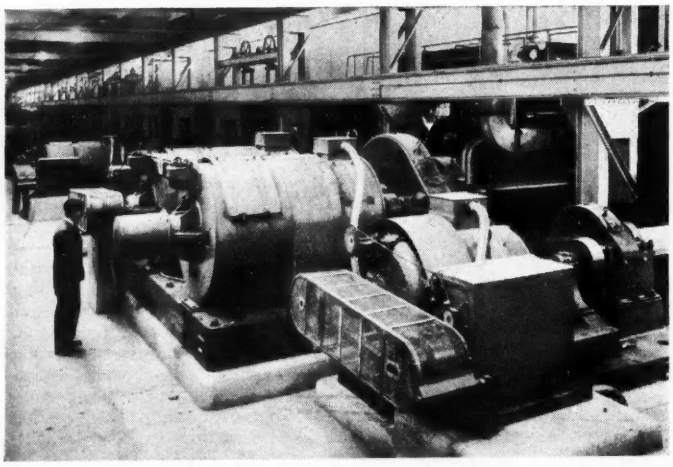
Certain types of equipment, notably machine tools, call for a number of different speeds, each of which is fixed for a fairly definite period, in contrast with variable-speed work in which any speed within certain limits may be called for at any time. Such multi-speed machines are catered for by change-speed motors; that is, s.c. motors with two or more windings. Higgs explained that all their two-speed motors had a star-connected winding and four-speed machines contained two windings, one of which was of the consequent pole type.

By alternative connection the consequent pole winding serves for two speeds, one of which must be twice the other. Three-speed machines contain one consequent pole winding which gives two speeds and the third speed is obtained by a separate star-connected winding. Mr. Richards said it was not practicable to supply a motor with a speed corresponding to ten poles, *i.e.*, 600 RPM at 50 cycles, with a four-speed winding because of the difficulty of arranging the slot combinations.

Mr. Nixon (Brush Electrical) said it had been found advantageous to operate certain rolling mills, gold and silver for instance, at high and low speeds, and that motors were available with windings arranged to give two or three speeds which were determined by simple switching devices.

It was interesting to hear from Mr. Stay (E.C.C.) that the cascade motor in which the motor of one machine is connected with the stator of the other is finding a useful application for change-speed work. With normal running the machines are in cascade and when the cascade connection is taken out a straight drive gives the alternative speed.

The simple act of switching on and off any " straight drive " motor is a measure of speed control, although straight driving is usually not included under this heading. One form, however, namely, the duty cycle, involves, by reason of the sequence of operations, a measure of speed control for a motor which would otherwise be a normal straight driving unit apart from special mechanical construction features to which we refer in other articles.



It must be possible to vary the speed of the paper machine as a whole and at the same time to vary the speed of the sections relatively; B.T.H. sectional drives for the large newsprint machine at Edward Lloyd's Kemsley mill

Dr. Macfarlane, of the Macfarlane Engineering Co., Ltd., said that the main problem in connection with duty cycle drives was the elimination of power losses. Generally, the centrifugal machines are used by unskilled natives (sugar industry) and during the season the machines have to run for 24 hours per day on cycles of 2 min. acceleration, one min. running, one min. braking and one min. stopping.

Variable Speeds

Probably the greatest difficulties in the choice of motors are connected with really variable-speed work, and we think that the means of speed control quoted by the Metropolitan-Vickers Co. in connection with paper-mill drives are generally representative—AC or DC constant speed motors with variable-speed gearing; variable speed shunt DC motors; AC commutator-type motors; DC with Ward-Leonard control; and buck and boost.

Mr. McKay, of Bruce Peebles, thought that there was a big future for the constant-speed s.c. motor with the hydraulic coupling for variable-speed work. He said collieries were beginning to adopt this scheme for driving haulages because it represented a big saving on the controller, while the actual motor conditions were simple variable-load ones.

One of our biggest difficulties in the course of this investigation was to attempt to assess the relative values for variable-speed drives of the AC and DC motor. Dr. Macfarlane said that for an application which was definitely variable-speed DC was obviously the appropriate system and any form of AC drive must be a compromise. Mr. Bailey (Bruce Peebles) felt that the problem was one of the extent of the speed range required, for whereas the AC commutator motor range started from a certain speed the Ward-Leonard scheme had " nil " for its limit.

A good deal of criticism is levelled at the use of slip-ring induction motors for variable-speed work, but as with all the problems this is bound up largely with that of initial cost. With particular reference to water pumping, B.T.H. engineers agreed that when the speed range required was less than 10 per cent. it was not worth while to install special variable-speed equipment and the induction motor was a suitable proposition. Other applications of the induction motor were given as colliery winders, small haulages and fans, and it was pointed out that some advantage was obtained by virtue of the infinitely variable control of the liquid controller, but also that this controller was not stable because the resistance of the liquid varied.

Mr. Richards pointed out that the s.r. motor had series characteristics, that speed reduction by resistance was wasteful and that variation is by way of speed reduction only. He thought the AC commutator motor was the next best to DC operation in that it gave speed steps in very close limits irrespective of the load.

Commutator Motors

It is generally agreed then that for variable-speed work by AC motors the commutator motor is called for. There are two types, movable-brush (Schrage) and fixed brush (with an external regulator). The B.T.H. Co. said that there were certain definite advantages for each type of machine, but that there was no answer to what was the best type, for this depended on local conditions. The fixed-brush motor was generally more suitable for the larger drives, *i.e.*, up to, say, 500 HP.

A particular application for which the Schrage motor has been carefully included as part of a system drive is the paper-making machine. It must be possible to vary the speed of the machine as a whole but at the same time to vary the speeds of the sections relatively.

Higgs said that while the basic principle of their commutator motor lay in the fixed-brush position and the variable ratio transformer, it had the added advantage of an auxiliary winding in the rotor which had the effect of preventing any tendency to sparking and an auxiliary winding in the stator circuit which had the effect of further improving the power factor. The output developed was in exact proportion to the speed. Some of the applications of the Schrage motor are: printing, paper-making, rubber calenders, pumps, machine tools, compressors and spinning (textile).

A rather specialised application of the fixed-brush AC commutator motor is to the driving of pulverised fuel feeder equipments as catered for by Electro-Dynamic Construction Co., Ltd. The requirements are infinitely variable 3 to 1 speed regulation so as to keep the feeder exactly in step with load variation. The induction type speed regulator can be installed at any position away from the motor and all the boilers can be tied to operate in synchronism.

Generally, Scherbius drive with its main induction motor and auxiliary speed controlling commutator motor was considered out of the range of the Schrage motor, said the B.T.H. Co. A figure of 30,000 HP was suggested as the upper limit of this system. Supply limitations are responsible for a growing demand for variable speed on single phase. A Schrage motor has been built for single-phase work, and special applications are to laundry ironers, biscuit and cake ovens and provers in the bakery and small lifts.

The Batwin single-phase variable-speed motor is designed so as not to have unduly pronounced series characteristics. After the neutral point has been passed with the brush gear the motor reverses and the speed can be varied in the opposite direction.

Mr. Eley (G.E.C.) agreed that the call for variable speed is not very marked in the fractional HP field, although, he said, the vacuum cleaner motor, for instance, had more speed variations in service than probably any other motor, but they were uncontrolled. He told us of a scheme with applications in the dental surgery, and in the tropics for fans, whereby a vibrating contact is inserted in circuit with the series motor. Speeds can be chosen accurately by arranging definite relationships between the " on " and " off " times of the contact.

FEED-WATER TREATMENT

By F. Kenyon, A.I.C.

WITH low-pressure boilers, feed-water treatment, if any, may be only that necessary to keep the amount of boiler scale within reasonable bounds. It would generally result in the feed water being alkaline, this affording some protection to feed lines and economisers where the make-up water is hard. Where it is soft or peaty, boiler scale would be almost absent, but there would be more possibility of corrosion in the feed system. This could be kept in check by adding soda-ash or caustic soda to the feed water.

When treating hard water for a low-pressure plant, one should always keep an eye on what might happen, due to the treatment, inside the boiler itself. Provided the boiler feed water is fairly alkaline, the oxygen content of the feed is not of the first importance, but its concentration should be kept as low as possible. An average oxygen figure of 0.3 c.c. per litre for pressures below 250 lb. per sq. in., and where the pH is about 9, should not cause any material damage. The type of economiser may decide what risks can be taken with the feed water. For instance, it is probable, other things being equal, that an economiser with mild-steel tubes and a high water velocity would better withstand corrosive attack than would a unit with iron tubes and a low water velocity. One should be wary of bicarbonates in the feed water, as the CO_2 liberated therefrom can cause corrosion in the steam and condensate systems, which would be intensified by the presence of undue amounts of oxygen.

High-pressure Plant

Generally speaking, as the boiler pressure increases purer feed water becomes necessary, not only in regard to the dissolved solids, but also to the non-condensable gases present. In high-pressure systems it is also important to have some control of the alkalinity or pH of the boiler feed water.

Dissolved solids may or may not cause scale deposition or corrosion in heaters, feed lines and economisers. I have heard statements that where there is scale, there cannot be corrosion. This, however, is only partly true, and whilst a surface covered with scale would present a bold front to corrosive influences, it does sometimes happen that the scale is deposited in the feed heating system along a particular temperature range, and points that are not so protected are thus exposed to corrosion. Phosphate conditioning is used to prevent this scale formation, but if not properly applied deposits may occur in the system.

Various materials, including specially prepared tannins, are sometimes added with the phosphate and these prevent the calcium phosphate adhering to a metal surface. In treatment such as this, however, the boiler is the receiver general, and overloading the feed water with this, that and the other, may result in other troubles. It is not always possible to evaporate a make-up water, which would be the best remedy for the above problem, nor would base-exchange softening be a good scheme, but treatment with hexa-meta phosphate (Calgon) may fill the bill if not too costly. This type of treatment depends upon the scale-forming materials being held in solution by the Calgon under certain conditions, and finally converted into phosphate sludge in the boiler itself. Complex soluble salts are formed between the Calgon and the calcium salts, and provided there is an excess of Calgon present, these soluble salts remain in solution until they reach the boiler. Calgon also has the property of being able to dissolve the scale already deposited in a system, which can be then removed by blowing down the boilers. In practice, better results both in preventing and removing scale, are obtained by adding this chemical in concentrated doses, rather than by continuously injecting a comparatively dilute solution.

A possible source of feed-water pollution is the leakage of emergency supply water into the system. Periodic inspection of the valves and float valves, or tests on the water at these points should be considered. In condensate systems the priming and/or steam carry-over from the boilers, and its possible effect on the quality of the feed-water, should be investigated. This type of feed-water contamination may occur only at certain boiler loads or other conditions, but it should be borne in mind.

Steam condensing plant may add its quota of undesirable dissolved matter to a feed-water system, due to leakage of cooling water into the condensate. This would usually be remedied long before much damage could be done in the feed-heating system, but the magnitude of the leak and the quality of the cooling water might be such that the boiler waters would require some immediate attention. This would then mean an efficient routine control of the feed-water, with the aid of a recording instrument.

A set of curves showing the concentrations and conductivities of the various substances usually encountered in feed-water control, will be found useful. The gases CO_2 and ammonia, particularly, have an appreciable effect on the conductivity of a purified feed water.

The evaporation of water for boiler make-up does not always provide a feed water beyond reproach. Evaporators are liable to prime if the concentration of the solids in the shell is allowed to proceed, particularly if certain alkalis are present. Blowing down haphazardly may fail in its object and is wasteful. Conditions governing the frequency and quantity of blowdown can easily be ascertained and a generous margin allowed. Evaporator priming can reach serious proportions if the casing pressure is liable to vary, but this is not catered for in the design of some evaporators.

When there are several possible sources from which a boiler feed-water can become contaminated, even if only for short periods, it is often considered necessary to have conditioning

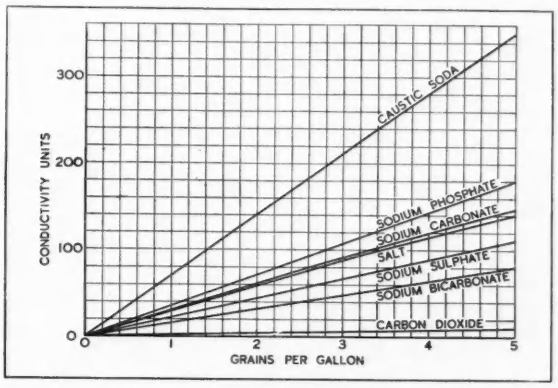


Fig. 1.—Conductivity of some solutions of boiler chemicals, &c.

chemicals present in the boilers. These are frequently added to the feed-water either continuously or in relatively concentrated doses. Apart from the addition of small quantities of caustic soda, often necessary to give the feed-water a slight alkalinity at all times, I suggest that the latter method is better and safer—better because it is so much easier to ascertain the presence of leakages when the feed-water is relatively pure, and safer since there will be little chance of feed system deposit due to interaction of conditioning chemicals and hardness salts in the feed-water during leakage. This point may not apply to the use of hexa-meta phosphate, but some consideration should be given to the problem when tri-sodium phosphate is the conditioning chemical. If the latter can be pumped directly into the boiler units, so much the better.

Non-condensable Gas Content

Even with priming non-existent, the distilled water from an evaporator may contain dissolved gases which are not desirable in a boiler feed-water. CO_2, for instance would be a constituent of the distilled water produced by evaporating a water containing appreciable amounts of temporary hardness. Efficient de-aeration of this acid water would make it suitable for addition to the boiler feed-water, but the common practice of putting the hot distilled water into the boiler feed water system *via* the condensers is inadequate. It removes most of the oxygen but not all of the CO_2, and an acid feed water may result. In one case the boiler feed water was acid to the extent of about 0.05 gr. per gal. of free CO_2, and economiser tube attack was definitely apparent after six or seven months. This corrosion was arrested to some extent by the addition of caustic soda to the feed water, but it was difficult to attain the desired pH in the feed water without alarming concentrations of caustic soda in the boilers, or excessive blowing down. Some form of chemical treatment of the make-up water before evaporation may therefore become necessary, and lime-soda softening is often prescribed. Another method which has met with some success, is to inject milk of lime into the working evaporators periodically. The hydrated lime combines with the bicarbonate hardness in the

make-up water, and an evaporate free from CO_2 results. It is a good practice to drain the shell of an evaporator when it is to remain out of service for some time, otherwise serious corrosion at and below the water line is probable, particularly with the tubular type.

With any system evaporating a water containing free ammonia the feed water will contain some of this gas, especially if the make-up is mainly condensate. This appears to be due to both the steam and the pure condensate becoming contaminated with this gas, more of which is added to the system by the evaporate. The vicious circle continues and the ammonia content of the feed water settles down to a constant, provided the ammonia contained in the initial water supply does not vary greatly. Should it do so then a new ammonia constant for the feed water will occur. These ammonia constants in the feed water do not bear a direct relationship to the amounts of ammonia in the make-up water, but they are governed by the partial pressure and solubility of ammonia gas at the conditions existing in the condenser and/or de-aerator. It may be, therefore, that the quantity of ammonia eventually dissolved in the feed water will be of the same order as that contained in the initial make-up water supply. A look-out should thus be kept for the presence of even small quantities of ammonia in a make-up water, as amounts of 0.01 to 0.02 gr. per gallon of free ammonia can interfere with conductivity measurements of boiler feed water.

In feed-water systems which normally have low conductivity readings, 2 to 3 units or thereabouts, the ammonia entering a system from a "town-main" make-up water supply might have an appreciable effect on the conductivity readings. Tests for this gas should therefore be made when small increases in conductivity readings occur, which otherwise cannot be accounted for. My own experience is that free ammonia in relatively large amounts does not cause material damage, at boiler pressures up to 400 lb. per sq. in., to such items as the feed-heating system, the boiler itself, superheater, steam receiver, turbine or condenser, but that it may cause serious damage to the condenser air pumps, depending upon the design and the materials used in their construction. One type of multi-stage air pump containing Admiralty brass tubes in all stages was unaffected after several years by ammonia concentration of 1 to 2 gr. per gal. in the drains of the last stage, whereas on another design similar tubes in the last stage were severely corroded within 1,200 service hours.

Dissolved oxygen content of the feed water is very important in a high-pressure plant. Closed-feed systems originated mainly because of the damage caused by this gas, but many such systems are far from perfect. There are many points from which oxygen can gain access to the system, and numerous tests may be necesary before a leakage can be detected and remedied. Instruments giving a continuous record of oxygen content will be found very useful.

The effects of oxygen corrosion are usually most marked in the economiser, boiler drum and tubes, and entry to superheater tubes at the inlet header. If the boiler water is sufficiently alkaline and the circulation is reasonably good, oxygen corrosion will probably show itself only at and above the water line in the steam drum. A lack of caustic alkalinity in the boiler water would result in general corrosion throughout the unit, which would perhaps be most marked in the upper tubes of the boiler.

One cannot generalise and say that because a particular concentration of oxygen was innocuous in one system, it would be true to form in a similar system. It is always good practice to keep the non-condensable gas content of a feed water as low as practicable in regard to the plant conditions and, particularly in a new plant, never to miss any opportunity of inspecting economiser tubes, steam drums and boiler tubes.

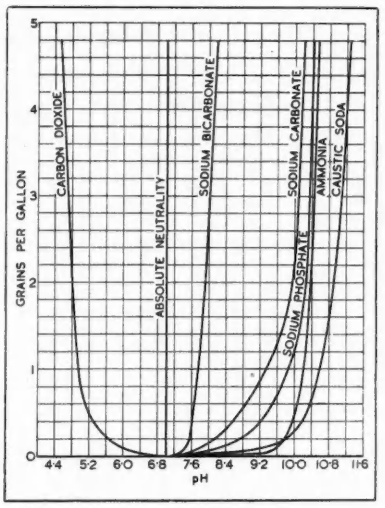


Fig. 2.—Relationship between pH and concentration of various chemicals

pH Values

Alkalinity or pH is a measure of the active acidity or alkalinity of a water, and is usually referred to as the hydrogen-ion concentration or pH. There is a connection between the pH of a boiler feed water, particularly a highly purified one, and the possibilities of corrosion in the feed-heating system and in the boiler itself. The general practice is to have a slightly alkaline feed water, with a pH of 8 to 9 depending upon local conditions, and caustic soda solution can be conveniently used to achieve this end. In an endeavour to attain a certain pH in the feed water, however, more caustic soda than is desirable may concentrate in the boiler waters. In plants where little or no alkali is added to the feed water and corrosion in the feed heating system is negligible, one is tempted to ask if ammonia is present in the feed water. Small quantities of free ammonia have considerable effect on the pH values of a feed water, and it would be of interest to know if this gas plays a part in feed water control in isolated cases only.

Electricity Supply in Sweden

THE consumption of electricity in Sweden has increased rapidly during the past few years, and in 1938 reached a total of 8,150 million kWh, which is nearly double that in 1929. Mr. H. A. N. Bluett, O.B.E., Commercial Secretary to H.M. Legation, Stockholm, in his report to the Department of Overseas Trade on economic and commercial conditions in Sweden (Stationery Office, 2s. net), states that this consumption represents what twenty-five years ago was regarded as a possibility in 1945. The fact that most of the main railway lines have been electrified is of comparatively slight significance in this respect, the major increase being due to industrial expansion. From the point of view of revenue, however, domestic consumption, street, road and shop lighting have been responsible for the greatest improvement.

In consumption of electricity per capita, Sweden now occupies the third place after Norway and Canada, which are in a class by themselves. The next group comprises Sweden, the United States and Switzerland where Sweden during the 1926-29 boom was last, but has now advanced to the first place. The third group, after a wide gap, is headed by Finland, which has forged ahead of late years at a great pace.

Generation by steam power was somewhat less than during the preceding year, when it was about 1,000 million kWh, or 13 per cent. of the total production of electrical energy. At the beginning of the year the total amount of water power which had been developed in the country was 1,580,000 kW, and the power in process of development 227,000 kW. Increased demands for power were made by the railways, by the completion of a large new electric furnace for iron smelting, by electro-chemical plant connected with the pulp industry, and for agricultural purposes. The authorities are actively increasing the demand for electricity by propaganda and instructional work, especially in the provinces.

Junction has been effected in Sweden between the Porjus water-power station in Lapland and the networks of central and southern Sweden and lower Norrland, thus linking up the whole of the Swedish State power distributing system. So far the junction is merely provisional, but it will be definitely established next year, when the 220-kV line from Lapland to the steam reserve plant in Västeras, Central Sweden, will be completed. This line will be about 1,000 km. long, which is an unprecedented distance for European conditions. The new connection enables the Swedish Board of Waterfalls to utilise in central and south Sweden the great surplus of electrical energy generated by the Porjus station, estimated at 150 million kWh. The Board at present generates between 30 and 40 per cent. of the energy consumed in the country and is constantly extending its power stations and improving the water supply by the regulation of the lakes.

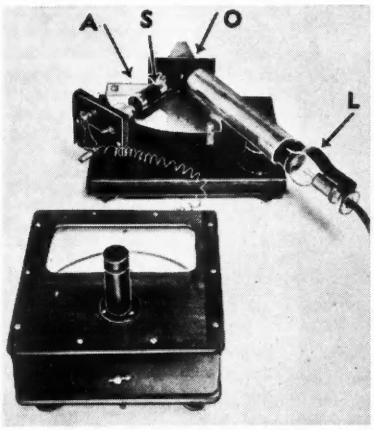
The further exploitation of Swedish water power is proceeding apace; the big dam system within the Arctic circle is being extended, and new stations are planned, being built, or have recently come into operation, e.g., Järpströmmen, to cost 29.5 million kr. and to develop about 100,000 kW; Langhagsforsen A/B, 65,000 HP, to cost about 12 million kr.; Skymnäsforsen, belonging to Uddeholms A/B, to cost about 5.2 million kr.; Hojumsverk, near Trollhattan, 67,000 kW, to cost 14 million kr.; and Kattsrupsforsen, to develop 30,000 kW.

Swedish engineers are collaborating with the authorities in New South Wales and Victoria, Australia, regarding proposed water storage, irrigation, hydro-electric and power transmission schemes.

ELECTRO-PLATING

The Use of Photo-tubes for Measuring the Lustre of Metals

INVESTIGATIONS carried out in Germany by Dr. Max Schlötter and Dr. Schmellenmeier with a view to defining exactly the value of metal coatings show that the rule-of-thumb " the thicker the coating, the better the protection " is, while not actually erroneous, at least uneconomic, as it often leads to unnecessary waste of the coating metal and disregards other vital factors that may make the thickest of metal - coatings almost valueless.



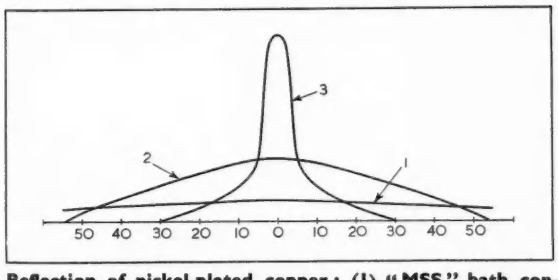
Details of the measuring instrument

An essential point in plating practice is the structure of the surface to be coated as well as that of the surface of the plated unit. The outside structure of metals can be defined with sufficient exactness for all practical purposes by the optical effect of its lustre, *i.e.*, the reaction of the surface to light. A surface reflecting light with mathematical precision is called lustrous, whereas a surface diffusing the light is non-lustrous or dull.

The more pores there are in the surface of an electro-plated metal the greater is the risk of corrosion, the pores are the points where corrosion first sets in and from where it attacks the surrounding metal coating as well as the underlying base metal. Dr. Schlötter and Dr. Schmellenmeier claim to have proved that: (1) The number of pores is proportional to the roughness of the underlying surface of the base metal; the rougher, *i.e.*, the duller the surface of the base metal, the more pores appear on the surface of the finished electro-plated object. (2) A certain degree of lustre indicates when the coating is sufficiently thick to prevent the appearance of pores and thereby to prevent corrosion; after reaching this stage, any further coating becomes superfluous.

Defining Resistance to Corrosion

The practical importance of these deductions is first, that the practice of leaving the base metals for electro-plating unpolished will give way to the polishing of metals prior to bringing them into the plating bath. Secondly, by indicating



Reflection of nickel-plated copper: (1) "MSS" bath containing sulphate of nickel, (2) Citric bath nickel, (3) "Lux II" nickelling bath

the minimum lustre of the electro-plated articles the resistance to corrosion can be defined, or buyers may ascertain, by measuring the lustre, whether particular electro-plated goods are sufficiently proof against corrosion.

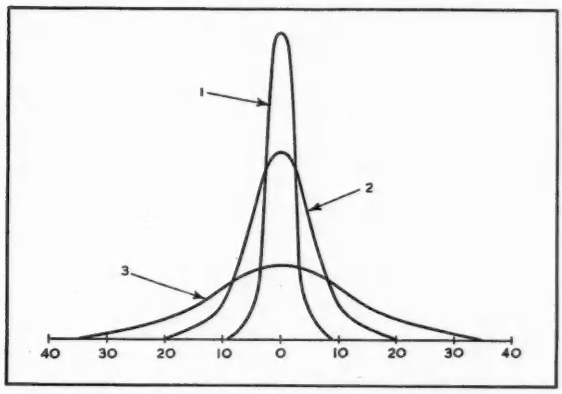
The instrument illustrated was designed for measuring the lustre of metals. It consists of an 18-V, 45-W lamp, L, with a filament wound round a straight core. A beam emitted by L passes a slot and a system of lenses and falls on the surface to be tested, O, whence it is reflected to the slot, S, of the light catcher, A. A reflection of the spiral filament of L is then found on S. Behind S there is provided a pane of opal glass and 2 in. behind this is a photo-tube.

Large thin sheets of metal, not absolutely plane, can be pressed down to a plane support by a disc leaving only a small piece of the surface 2 mm. wide under observation. In order to avoid interfering reflections, the edges of the disc are blackened. The light-catcher, A, is mounted on a rail and may slide in the plane LOS about a turning point lying exactly under O, so that the whole field of diffuse reflection from O may be covered by A. Since the source of light is arranged to reflect the light from O under an angle of 45 deg., it is sufficient when A covers a quadrant extending to both sides of the chosen direction. The less the lustre, the more diffuse becomes the reflection and the more light falls on the quadrant outside this direction.

Graphical Record

The reaction of the photo-tube is recorded in the usual manner, and the diffusion of light is represented by a more or less rising curve. When the test metal is very bright, *i.e.*, when almost all of the reflected light is concentrated upon and around the point where the beams fall on the photo-electric cell under a 45 deg. angle, the peak of the curve is high and its sides slope downward very steeply. It can be assumed that the light emitted by the filament of L is distributed equally over the whole surface that the beam covers, as the beams emitted by a tungsten filament at 2,500 deg. C. follow approximately the Lambert law of radiation.

The width of the slit before the bulb L is 0.8 mm. and equals the width of the slit S before the light-catcher A. Under ideal conditions and with ideal reflection, the curve of light distri-



Distribution of light on (1) glass mirrors, (2) polished silver deposit, (3) dull silver deposit

bution on the tested surface must be triangular, the base of the triangle having a length of 1.6 mm., *i.e.*, twice the width of the slit. In reality, the curve is always rounded off, because slight inexactitudes cannot be eliminated altogether and no surface, not even that of good glass mirrors, is so lustrous as not to diffuse a small part of the light reflected.—A. B. (Germany).

Electricity for Wine Making

A VERY considerable development in the use of electricity in the wine industry in Algeria has taken place in the past few years, where consumption for this purpose is now estimated at approximately 8,000,000 kWh a year, reports our Paris Correspondent. Grapes are brought to the cellar in suitable vehicles and placed in hoppers. These empty into crushers, and pumps force the grape mash into fermenting vats. According to its capacity, one of these crusher and pump groups will require motors of 3 to 10 HP. A large cellar may produce anything up to 6,000 cwt. of mash per day. During fermentation of the mash careful regulation of the temperature is necessary. This is accomplished by allowing the juice to flow out of the bottom of the vat into a suitable cistern placed below it and then pumping it back into the top through a cooler. After fermentation, the juice is allowed to run out and is pumped into the bottling vats, from which it runs to bottlers. The remaining mash is scraped out of the vat and pressed frequently by continuous-feed, screw-type compressors. These remove nearly all the remaining wine from the mash, which then goes to hydraulic presses. The wine pressed out in this way forms a cheaper quality. Finally, the mash, pressed dry, is filled into vats in which it is rolled down by means of a small electrically operated roller. This mash, after further fermentation, is distilled for its alcohol content.

ULTRA-VIOLET LIGHTING

Its Use in Generating Stations in War-time

By R. H. Finch

PERHAPS no problem has caused so much concern to those responsible for safeguarding the country's electricity supplies in time of war as lighting in generating stations. Almost any ordinary industrial premises could rely on shutting down during an air raid, but generating stations must carry on, and while work in these circumstances would obviously be kept down to the bare minimum, certain operatives would have not only to attend to the running of the plant, but also to the carrying out of complicated switching operations to cope with damage to mains and feeders, and might even have to start up or shut down machines or boilers if their own station was damaged.

For power stations would naturally form one of the chief targets for enemy bombs, and as most of them are situated in parts of the country particularly susceptible to air attack, it is to be expected that, at the best, every window pane would be broken early during hostilities, and that, even if blacking out of the windows had not been relied on and stout shutters had been fitted, the enemy would succeed in placing one or two bombs close to the station, with resultant structural damage.

No ordinary system of lighting or even an emergency system could therefore be expected to operate successfully in a power station in war time. Even the most carefully shaded lights cast an appreciable illumination on some surface, and as it would be impossible to rely on the building being kept light-proof, no light could be permitted even inside. A solution of the problem can, however, be found in the use of ultra-violet or "black" light as it is sometimes called.

The output of a "black" lamp can be reflected and redirected in exactly the same way as visible light. The whole station could be bathed in ultra-violet energy and light produced only where needed (such as on the handles of switches, meter scales, push buttons, telephones, doors, keyholes, tables, desks, stairs, fire extinguishers, &c.), by the application to them of a dab of fluorescent paint or dye.

The daylight appearance is unaltered, providing the paint is not put on too thickly.

Although some of these paints remain luminescent when the light from the black lamp has been extinguished, their effectiveness cannot generally be relied upon for more than a quarter of an hour afterwards.

On switchboards or in control rooms, the switch handles, trip

125-watt ultra-violet lamp with outer bulb broken away to show internal construction

catches, buttons and relays and handles of rheostats with their pointers should be painted. Small press buttons should be surrounded by 2- or 3-in. circles. Fuse positions can be delineated by outlining them or by spotting the carriers with paint. The lettering of engraved name plates should be filled in with paint mixed to the consistency of thick cream. Non-engraved name-plates can be covered with a thin wash. Positions of keyholes and door catches of enclosed apparatus should likewise be indicated and the receiver mouthpiece, keys or plugs and sockets of any telephone equipment should also be painted.

On the floor in front of every switchboard should be painted a line 12 to 18 in. away. This line should be brought into the board at each side of every opening or door giving access to the back of the board, and a line should be painted round the edges of each door. The shape of every obstruction near an open switchboard or in a control room should be delineated by floor lines or patches of paint.

The treatment of switchgear is greatly helped by the natural fluorescence of common vaseline. This enables fuse carriers to be replaced with ease and without fumbling, and also gives clear indication of the presence and position of knife-switches and other live metal on the face of the board. All live metal in exposed positions liable to be accidentally touched in the dark can be rendered visible by smearing with vaseline.

In the engine room and boiler house, the maximum use should be made of fluorescent floor lines to indicate clear passages round and between the machinery, and written direction notices and arrows may be painted on the floor.

Mr. R. H. Finch of the Lighting Section of the British Thomson-Houston Co., Ltd.

Railings round pits and staircases can be indicated, either by fluorescent paint or by entwining round them a fluorescent plastic which is available in string form. The treads of staircases are best indicated by thin lines along their edges. The general shape and all projecting portions of any piece of machinery should be indicated by dabs or thin lines of paint, any exposed hot surface being shown by thin diagonal red lines.

Pressure gauges, operating handles and valve wheels as well as scale plates of all gauges and indicators should be treated. The position of circulating- and feed-water pumps and of water and steam pipes should also be shown by means of the paint.

Fluorescent chalks are also available for writing emergency warnings or notices in the darkened station and it is possible to dye the overalls of the charge engineer and other principal members of the operating staff so that they may be easily located.

As fluorescent materials can now be obtained in almost any colour, the daylight colour scheme of controls and switchboard labels can usually be followed in fluorescence. Only the best quality paints should be used on meters, switchboard controls, and similar parts of the equipment, but considerably cheaper paints may be used for such purposes as floor lines and obstruction markings. White, blue-white, pale green or pale yellow colours should be used for general purposes, red and orange being reserved for emergency trip buttons and similar controls and for warning notices.

Only small dabs or thin lines (not more than half-an-inch wide) of paint should be employed in any situation, since large areas of brightness will obviously defeat their own purpose of ensuring invisibility from the air. Although the powders, which form the basis of all fluorescent paints, are comparatively expensive, the actual cost of a complete scheme is not high, since only a few ounces are necessary to treat an entire station.

Harmless Rays

The rays given off by the "black lamps" used are of a wavelength of 3,650 Au and have none of the sunburning and dangerous properties of the shorter wavelength ultra-violet rays proper. Their entire harmlessness is demonstrated by their considerable industrial use, particularly in connection with invisible fluorescent laundry marking systems, in constant operation, without a single case of ill-effects in operatives.

The output of the lamps can be reflected in exactly the same way as that of ordinary lamps, and the same type of reflector should be chosen as for visible light. Existing reflectors may sometimes be used, but most enamelled surfaces are poor reflectors of ultra-violet energy, the most efficient being metallic, such as chromium plate, or, best of all, anodised aluminium.

A number of the lamps should be arranged in the roof to give general illumination for floor lines and obstruction markings, such positions as turbine driving platforms or switchboards, where a number of intricate controls is closely grouped, having an additional lamp each. The reflectors should be arranged so that the lamps are well screened, no direct rays proceeding above the horizontal. For such controls as might have to be urgently and quickly operated the lamps should be not

(*Concluded at foot of next page.*)

CORRESPONDENCE

Every letter must be accompanied by the writer's name and address preferably, but not necessarily, for publication. The Editors cannot accept responsibility for correspondents' opinions

Association for Meter Staffs

I AM very pleased to find that another meter engineer is interested in the formation of an Association for meter engineers. I am of the opinion that whilst the Meter and Instrument Section of the I.E.E. caters for the academic side of meter engineering, there is still plenty of room for an association to deal with the practical side and I should be very pleased to see such a body formed. C. B. GREEN,

Wallington, *August 21st.* *Meter Superintendent.*

Two-part Tariff Fixed Charges

Mr. Busbridge's survey of two-part tariff fixed charges in your Correspondence columns is interesting but surely incomplete. Stated simply, the function of two-part tariffs—or any other form of tariff—is to secure sufficient revenue to recover the cost of supply plus all other charges. The primary considerations to be satisfied are that the form of tariff employed shall accurately pass on to the consumer the various costs as they appear in the undertaking cost sheet and that hit-and-miss methods shall be completely eliminated from the minds of consumers.

It is, of course, a commonplace that the cost of grid supply varies widely according to place and circumstances, but in any case it may be stated that the cost of grid supply is £X per kW of m.d.—on an annual basis—plus Yd per kWh at the incoming sub-station, plus correction factors in respect of transmission and distribution losses and adjustments in respect of coal prices. These are definite costs which can be ascertained without difficulty and usually form the basis of the tariff which is operated in respect of industrial supplies.

Immediately an undertaking departs from the principle of moulding its retail tariffs on the lines of the buying tariff, then speculation enters into the considerations and the trading result may be anything. If the idea of relating the fixed charge component of two-part domestic tariffs to rateable value, floor-space, area, &c., can be justified on business grounds, then surely there can be no grounds for objection to the C.E.B. framing its tariff along similar lines, *i.e.*, related to rateable value of the area served by the undertaking instead of kW of m.d. The speculation ought not to be a one-sided affair as at present, with the supply authority carrying all the risks.

It does not seem to be recognised that the intermediate costs and charges (apart from the cost of actual bulk supplies) vary widely in practice. Two undertakings having similar outputs may show capital expenditure which differs by as much as 50 per cent., while the outstanding debt may differ by as much as 100 per cent., both of which would be reflected in the interest and loan charges applicable. Likewise, rate contributions for similar undertakings may vary between £5,000 and £25,000 per annum, and provision for the difference in on cost must appear in the form of tariff employed.

Speaking generally, it seems to be the case that capital expenditure is proportional to area and the revenue proportional to population, and so long as there exist densely populated cities and towns of comparatively small area and, *vice versa*, sparsely populated towns and districts covering fairly large areas, a standard tariff might provide (*a*) excessive revenue having regard to the costs of the undertaking, or (*b*) insufficient revenue to meet the expenditure.

I should like to know how it is possible to operate a standard tariff without recourse to a standardised size of undertaking, standardised number of consumers, standardised capital accounts, standardised working and management charges and, of course, standardised bulk supply charges. Even so, a further step would be necessary, *viz.*, standardised consumers so that their requirements and consumptions would be comparable—in other words standardised incomes.

Whitworth, *August 18th.* J. RATCLIFFE, A.M.I.E.E.,
Electrical Engineer and Manager.

An Indian Accident

My attention has been drawn to the letters of R.M.F. and Mr. H. G. Taylor which appeared in your issues of June 23rd and June 30th, respectively, regarding the fatal accident* which occurred in April last, on the Hussain Sagar Lake, Hyderabad. Mr. Taylor's explanation undoubtedly is basically correct, but is not quite accurate for the following reasons.

The overhead line which figured in the accident was part of a three-phase, 6,600-V system. The neutral point of the system, however, was unearthed except through a potential transformer of high impedance which operates a fault-indicating device. When the mast (which was thoroughly wet) struck the first conductor, it formed a path to earth only for the capacity currents and also for the small primary current of the potential transformer. The conductor then broke and fell into the lake.

Almost immediately afterwards the mast fouled a second conductor. This time, full phase-to-phase voltage was applied through the mast, boat, and surrounding water, forming a circuit between the broken end (on the live side) and the unbroken conductor which was making contact with the mast. The resistance of this circuit, however, was too high to enable the circuit-breaker to clear the fault. A few seconds later the second conductor broke, fell into the water, and caused the breaker to trip.

It is my belief that it was during the period between the breakages of the first and second conductors, *i.e.*, during the maintenance of a high resistance phase-to-phase, fault that the survivor, R, suffered from such acute convulsions. The fault current presumably spread, like lines of force between magnetic poles, from the boat to the broken end of the conductor several yards away. Anyone lying within this field would experience the effects of potential gradient through his body from one side (or end) to the other. It is impossible to say whether the victim A was stunned as a result of the same phenomenon, or whether he was actually struck by one of the conductors in the act of falling. Certainly the mark on his elbow supports the latter contention, though death was found to be due to drowning and not to shock.

The underground cable referred to in R.M.F.'s letter, of course, had no bearing on the accident.

H. C. H. ARMSTEAD, B.Sc., M.I.E.E.,
Director, H.E.H. The Nizam's Electricity Department.
Hyderabad (Deccan), *August 10th.*

[* Two men, A. and R., were sailing on Hussain Sagar Lake when, in a storm, their boat came up against an electric pylon, the mast striking the overhead electric cable. Both men jumped out of the boat; R. leapt well clear but A. could not. When the mast came into contact with both wires they fused and sheared, and one must have touched A. on the arm near the elbow, where there was a reddish brown mark. R. was getting shocks so strong that sometimes he was flung forward on his face and the next was thrown flat on his back, and he could do nothing to help A., who later was found to be dead.]

Ultra-violet Lighting (*Concluded from preceding page*)

much more than 20 ft. away. A surprisingly low brilliance of fluorescence, in real darkness, can be tolerated for such markings as floor lines, and probably not more than five or six lamps would be required for the general illumination of an average sized engine room.

Ultra-violet lighting is no longer a "stunt," and is recommended for the emergency lighting in generating stations and similar premises in the Home Office A.R.P. Department pamphlet "War Time Lighting Restrictions for Industrial and Commercial Premises" (p. 10).

In conclusion, I wish to express my thanks to the British Thomson-Houston Co., Ltd., for much of the information contained in this article, and particularly for providing facilities for experiments with "Mercra" ultra-violet lamps and B.T.H. fluorescent powders.

Radio Interference Suppression

MR. G. W. INGRAM'S conveniently dimensioned book on "Radio Interference Suppression" is a topical publication from the offices of the ELECTRICAL REVIEW, Dorset House, Stamford Street, London, S.E.1, price 5s.

It gives advice on the most suitable types of suppressors for individual cases, being a comprehensive guide to ways and means of rendering electrical machinery and appliances, both industrial and domestic, reasonably incapable of interfering with radio reception. It should therefore be of much help to plant and accessory manufacturers who wish to render their products eligible to carry the special certification mark of the British Standards Institution.

CONDITIONS IN LATVIA

(From a Riga Correspondent)

LATVIAN industries used steam before the Great War and electricity as driving power was not employed to any notable extent. The situation, however, changed after the establishment of Latvia as an independent state. Efforts have been made during past years to replace expensive steam power by cheaper water power, but little progress was achieved until 1936 on account of lack of private capital and initiative.

Although Latvia, being a flat country, has only a few rivers which can be usefully employed for the provision of water power, investigations made by the State into the possibilities of electrification showed that Latvian rivers, of which the Daugava is the largest and offers the best opportunities, can yield a power of some 280,000-300,000 kW.

After careful examination of the conditions the Latvian Government decided to undertake the construction of a large hydro-electric power station on the river Daugava near Kegums (some 46 km. from Riga), which is estimated to produce a total of 70,000 kW. In the first stage of its construction the station will be equipped with three turbines for a total output of 50,000 kW. The station will cost in the neighbourhood of 40 million lats (£1,600,000). The building has been entrusted to a Swedish concern and it is expected that the station will be put into operation at the end of 1939. The importance of this new power plant in the electrification of Latvia is obvious, as hitherto of some 128 million kWh produced by about 70 power stations, only about 5 million kWh, or 3.7 per cent., was obtained from water power.

Of projects under consideration mention must be made of a peat briquetting plant which will incorporate a subsidiary thermal power station, the total cost of which is estimated at some £250,000.

For many years now Latvia has depended almost entirely on Germany for supplies of electrical equipment. In former years the volume of imports of manufactured goods were comparatively large, but the local electrical industries gradually developed and became more and more independent of foreign supplies, especially after the commencement of the activities of the State electrotechnical works "V.E.F.," which manufactures a large variety of articles.

After the introduction of the currency and import restrictions in 1931, the volume of foreign imported manufactured articles was considerably reduced, while on the other hand an increase took place in the imports of raw and semi-manufactured materials for the manufacture of electrical goods. Thus electric lamps, certain kinds of cables and wire and light fittings, clocks, heating and cooking apparatus, &c., are no longer imported from abroad but manufactured locally under protective customs duties. The construction of the hydro-electric power station has brought about an increased demand for cables, insulators, and other equipment.

Business in electrical supplies is done mostly through locally appointed licensed agents, but there are also a few branch establishments of German and Dutch firms. Cash payments are unusual, and goods are sold usually c.i.f. Riga against credit of from one to five months. Discount of 3 per cent. is offered for cash payments, but this is seldom accepted, and payment is made by drafts. In some cases the credit is extended, but interest on overdue bills is seldom charged. Practically all supplies for the requirements of Government and municipal institutions are purchased under the German standard specifications.

The currency restrictions now in force provide that sterling is automatically available for imports from the United Kingdom sanctioned by the Foreign Trade Department. The following customs duties are charged on certain electrical machinery and apparatus:—

	Rates in lats (Ls.25.28 = £1) per net kilo.
Dynamos, motors and convertors; transformers, choking coils	0.12
Small electro-mechanical tools and electro-mechanical domestic apparatus	2.00
Electrical appliances for starting, lighting and signalling for motor vehicles and cycles	1.50
Lamps and tubes with metal or carbon incandescent filaments	10.00
Apparatus for telegraphy, telephony and television, including valves, loudspeakers, microphones, &c.	6.00
Apparatus for measuring and registering electrical energy	2.00
Insulated cables and wire:	
(a) With lead covering or reinforced with other metals	0.30
(b) Insulated by means of natural or artificial silk	0.90
(c) Cut lengthwise and furnished with connecting plugs	2.00
(d) Insulated by means of other materials	0.60
Insulators, whether or not reinforced with base metals:	
(a) of ceramic materials	0.75
(b) of glass	1.20
(c) of other materials	3.00

Electricity in Industry

Report of the Chief Inspector of Factories

IN his annual report for 1938 (Stationery Office, 2s. net), Sir Duncan Wilson, the Chief Inspector of Factories, states that there was a decrease of 6 per cent. in the total number of accidents last year. Some of this decrease he attributes to the fewer men in employment, but he considers that the safety provisions of the Factories Act, 1937, may already be effective. Much, however, is due to the propaganda by safety organisations and to the appointment of safety officers. Accidents to workers under eighteen years of age were greater in proportion to the number engaged than in the case of adults.

In all, 180,103 persons were involved in accidents, 944 of which were fatal. Of the total, 560 (30 fatal), compared with 583 (36) in 1937, are ascribed to electricity; 73 (9 fatal) accidents occurred in generating stations, where 1,036 employees were injured (19 fatally) from all causes. In electrical manufacturing works 6,310 altogether were injured, 16 of whom died; these figures included 59 due to electricity, 20 causing death. Factories with mechanical power numbered 171,825, and those without 67,785.

There were thirty-eight failures of electrical equipment which were attended by fire or explosion. Six out of the seven personal injuries thereby caused were associated with switchgear. Another accident reported illustrates the danger of using v.i.r. cable for temporary work without adequate mechanical protection; in this case a portable concrete mixer tore the insulation, making the hopper alive, resulting in one man being killed and three being rendered unconscious by electric shock.

A somewhat similar accident with unprotected v.i.r. cables feeding a pump caused the death of a man wearing hob-nailed boots, and shocks to five wearing rubber boots. The need for the provision of properly constructed connectors with portable electric tools is shown by a further fatality described.

The avoidance of over-concentration of generating plant, transformers, and switchgear is urged not only on grounds of safety, but also because the increased demand for electricity results in increased dependence on public supply and on account of A.R.P. considerations.

When the Electricity Regulations for factories came into force in 1910 they probably covered 90 per cent. of the persons engaged in supply work, but although employment has increased fivefold, probably only 40 per cent. are now engaged in work covered by the Regulations. The latter have, however, created a standard, and it is therefore suggested that their extension to cover a larger proportion of employes would not result in drastic and costly changes in design and operation. References are made to the need to see that the breaking capacity of switchgear in factories is adequate to supply developments, and to the fire risks resulting from ineffective protection of circuits from persistent earth leakage. (The latter point is dealt with in this week's leading article.)

An outstanding feature of the year's work has been the extent to which advice has been sought as to the use of electricity where processes require the use of inflammable solvents or gases, for some of which no certified apparatus is available at present.

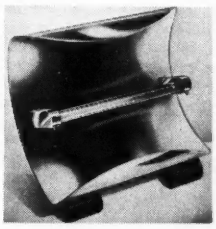
Mention is made of the installation of electric pottery kilns in the Stoke-on-Trent district, there being twenty-two in decorating and enamelling shops, while at a new factory at Barlaston an electrically fired biscuit and glost tunnel kiln will be the first of its kind in the potteries.

NEW FIRES

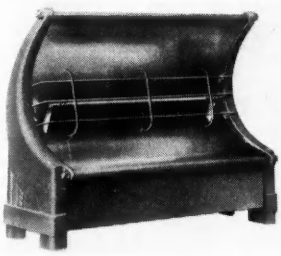
Some Designs for the Coming Season

IN addition to the new "Sylvanberry" suites mentioned in the ELECTRICAL REVIEW of August 4th six more fire designs are announced by Berry's Electric, Ltd., 85-86, Newman Street, London, W.1. The "Troonberry," a 3-kW imitation coal unit available at the same price as the leading 2-kW fires last season, has vertical reflector type elements splayed to give a wide angle of radiation (a very necessary feature for a 3-kW fire) and their arrangement is such as to give a chimney effect. As in all the imitation coal fires, the fuel has been further improved to give the impression of intense white heat in the centre and red at the outside.

A new market will be tapped by another imitation coal unit, the 2-kW "Juneberry," which with reflector type elements fitted horizontally is particularly low priced. It has an attractive curved front which forms a good-sized basket for the fuel, which a modernistic fret at the base gives the semblance of ashes burning. Two other models are intended to fit right into the slow-combustion opening of the ordinary fireplace. One, the "612," is a plain 2-kW unit with vertical reflector type elements, while the other "Justaberry" contains a large basket grate with two 1-kW vertical reflector type elements above, one-piece metal slips being supplied to fit any sized opening.



1-kW H.M.V. fire



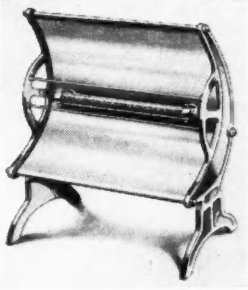
Ferranti "Minex"

Additions to the company's range of 1-kW reflector fires are the "Ovalberry," and the "Berrette," a neat portable model. Good ventilation is a feature of all models and standard finishes are "Berry Bronze" and silver.

Three new fires have also been introduced by Ferranti, Ltd., Hollinwood, Lancs. These are the "Minex," "Corona" and "Flamera Set-in," The "Minex" is an inexpensive 1-kW reflector fire with a chromium or "Solium" reflector and weighing only 4½ lb. The "Corona" is similar in appearance to last year's "Lumera," with the addition of a lamp, concealed behind semi-circular vanes, which floodlights the silver or copper background of the fire. The same design is used for the "Flamera Set-in," except that an imitation coal fire is substituted for the vanes. Both fires can be set into the hearth to cover up the fireplace opening.

The success of the H.M.V. wide-angle radiant fire introduced last year has led the makers, the Gramophone Co., Ltd., 363, Oxford Street, London, W.1, to introduce a 1-kW model on similar lines. The element has the same high working temperature and the reflector is of the simplified "Duplex" type with a wide dispersion of heat over a radius of 160 deg. A glass rod immediately in front of the element forms an unusual and attractive guard which is held by two spring clips. Swaged nickel and elements and special alloy clips are incorporated, and the terminals are concealed in a chromium plated cover. The feet are rounded and will not scratch a polished surface and the back foot is adjustable by means of a wing-nut to alter the angle of radiation. The foot can be folded back, and the slotted hole in it used for wall suspension. The weight of the fire is 4 lb. and the dimensions are 10¼ in. high by 11in. wide by 6¾ in. deep.

The only new Carron fire (Carron Company, Carron, Falkirk) is the "Beaconette," a simple 750-W reflector fire with a fixed reflector of chromium-plated brass, the end castings being of enamelled cast-iron. The weight is 6 lb. and the dimensions 12⅜ in. high by 11½ in. wide by 7 in. deep.



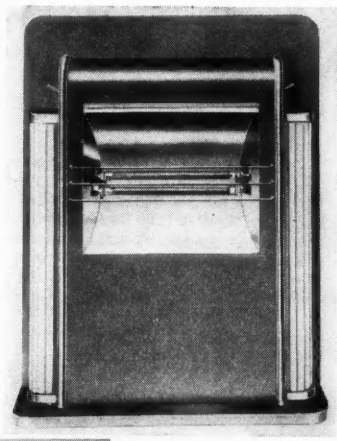
Carron "Beaconette"

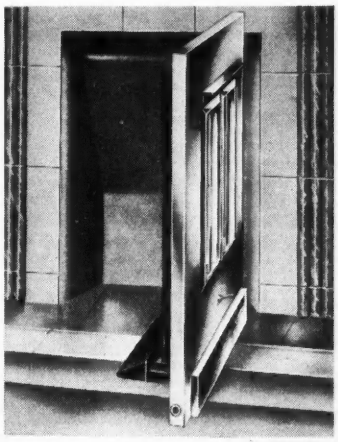
Among several new fires by the General Electric Co., Ltd., Magnet House, Kingsway, London, W.C.2, are D.2491, a 1-kW sheet metal panel fire with two ½-kW elements, and D.2534/5 sheet metal screen fires (1 and 2 kW), which are portable models with a pressed-steel top and base and a large single chromium-plated brass reflector.

A modern reflector fire of unusual construction is the D.2705 (2 kW), while a simple reflector model for wall mounting is the D.2712 which has a cord pull attachment to alter the angle of the beam. Illuminated glass panels down each side of the fire give a striking and unusual appearance to the model D.2556. The panels are lighted by a 60-W orange-sprayed lamp in the body of the fire and a switch at each side controls the two 1-kW elements in the chromium-plated reflector. Finally, in the new G.E.C. range is a simple reflector 1- or 2-kW fire mounted in a tubular frame.

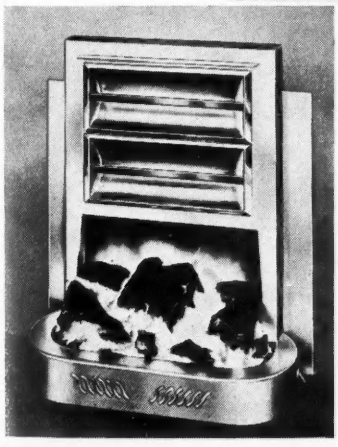
A new corner fire has been developed recently by Bratt, Colborn, Ltd., 10, Mortimer Street, London, W.1. It is one of the "Solectra" range finished in "Lustral" colours and fitted with a 1-kW element in a chromium-plated reflector. Ease and speed of fixing are features of this radiator, there being only two screws, one at the top and one at the base. These are screwed into a piece of wood previously fixed to the wall.

The "Sunrise" fire, which gives heat actually from the imitation fuel, has been further improved.

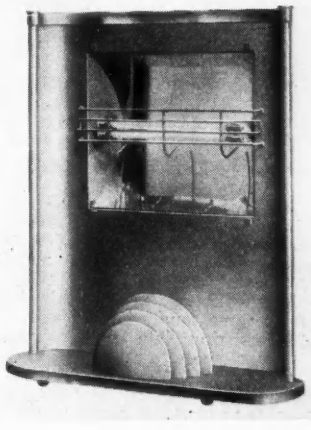




G.E.C. "D.2556" and Berry "Justaberry"



Berry "Juneberry"



Ferranti "Corona"

NEW ELECTRICAL PRODUCTS

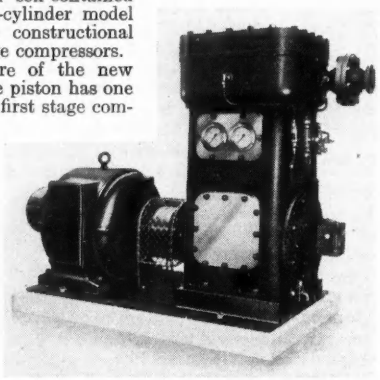
A Review of Equipment Recently Marketed

Monobloc Compressor

ABOUT two years ago J. BROWNETT-LINDLEY (1931), LTD., Letchworth, introduced a two-cylinder, two stage, monobloc compressor of extremely compact construction. The company has now developed a somewhat smaller compressor to meet the demand for outputs ranging from 150 cu. ft. per min. to 250 cu. ft. per min. at 80/150 lb. per sq. in. pressure. It has the same patented self-contained design as the two-cylinder model and all the main constructional features of the large compressors.

The novel feature of the new machine is that the piston has one diameter only, the first stage compression taking place beneath the piston and the second stage above.

This form of construction affords several advantages over the normal "stepped" piston type, both from the manufacturing and maintenance points of view, but in spite of its extreme compactness the same attention has been paid to accessibility.



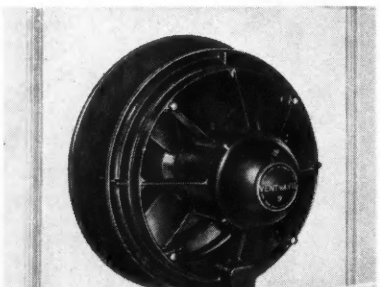
Browett-Lindley single cylinder monobloc compressor

The clearance volumes of the two stages are arranged so that the air from the first stage passes smoothly to the second stage without recompression. In fact, contrary to what might be at first expected, the volumetric efficiency is as high with this construction as with the normal two-cylinder type. The overall volumetric efficiency actually depends only upon the clearance space in the first stage, which has been made as small as is practicably possible. The clearance space of the second stage portion of the cylinder is larger than usual and advantage is taken of this to incorporate a ribbed cooler inside the cylinder. This acts as an auxiliary intercooler, and there is, moreover, a further cooling effect, due to the mixing of the air from the first stage with the cool air already present in the second stage clearance space so that the outlet air is exceptionally cool.

Exhaust Fan

A further addition to the range of exhaust fans made by VENT-AXIA, LTD., 9, Victoria Street, London, S.W.1. is the three-speed "Silent Nine" superseding the two-speed model of that capacity for AC mains.

The new fan, while retaining the attractive design features, simplicity of installation and low cost of upkeep characteristic of earlier models, has several important modifications. Control for AC supply is provided by a patent choke switch fitted with a red pilot light which also functions as a fuse.



Vent-Axia three-speed fan

Should the fuse blow, the supply is restored by removing the pilot light bulb. Any one of the three speeds may be selected at will. Driving the unit is a silent totally enclosed induction type shaded-pole motor.

An earth lead between the switch and unit is dispensed with and the fan is designed for continuous running under the most exacting conditions, it being claimed that the temperature rise of the motor is negligible.

A patent screwed spigot fitting, in combination with soft rubber washers, has the dual advantage of making the unit weatherproof and ensuring even pressure upon the window glass or fixing plate when mounted.

The volume of air dealt with at the three speeds is 20,000, 17,000 and 15,000 cu. ft. per hour, and the loading is 35 W. In common with other Vent-Axia fans the casing is of moulded bakelite in black or cream.

Voltage Regulators

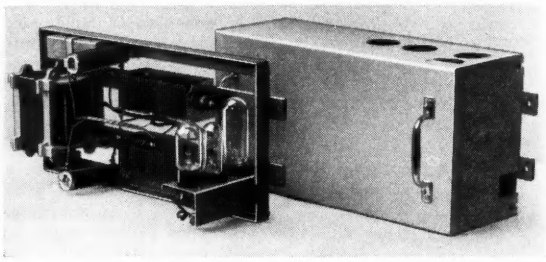
Where a finer degree of voltage regulation than is obtainable with a saturated transformer is required the neon tube has been extensively used, e.g., the multiple-gap discharge type, which is, however, expensive. Another method employs a barretter or iron wire in hydrogen, but this type, while having a control ratio of the first order, works on the thermal principle and entails an appreciable delay.

A cascaded combination of gas-discharge tubes and barretters designed to give extremely fine regulation is employed in voltage regulators manufactured by WATFORD INSTRUMENTS, Bridle Path, Watford.

The barretters and gas tubes are so loaded as to work on the correct part of their characteristics according to operating conditions and degree of control and each unit has, therefore, to be built to suit specific requirements.

One application of the system is to recorders and similar instruments, where fluctuation of supply voltage gives rise to appreciable errors. It is claimed that an output voltage can be maintained in which the error is less than the thickness of the recorder needle over any ordinary statutory mains voltage variation.

The manufacturers also produce multiple or cascaded gas-



Watford voltage regulator

tube units where no appreciable delay is permissible. Individual tubes cost only a few shillings compared with several pounds in the case of regulators employing multiple-gap tubes.

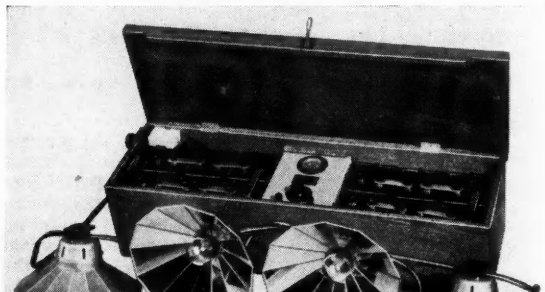
Emergency Lighting

An emergency lighting unit has been designed by the LAWLEY ELECTRIC STORAGE CO., 4, Great Queen Street, London, W.C.2, for use in the Home Office shelter for 50 persons, 30 ft. long by 7 ft. wide.

The unit comprises two banks of accumulators each of 12 V, 40 Ah actual) and is complete with charger suitable for mains voltages of 200-250 V, 40-100 cycles, incorporating a metal rectifier and rotary selector voltage/current control.

Each bank of accumulators is independent, and with the lamps supplied will give 8 to 9 hours continuous lighting. The unit is completely enclosed in a heavy, polished oak case 32 in. by 10 in. and 8½ in. high, and is supplied complete with all necessary fittings and with four light points of 12 W each.

The accumulator used is a dry one of the lead acid type constructed in a solid form. Its special characteristics are that it will stand rough usage and can be short-circuited or



Lawley emergency lighting unit

reversed without serious damage. It is claimed that it can be left in a charged condition on a shelf for years and will only require recharging to bring it back to its original condition. It is less than half the size of a primary battery, can be exported safely to hot countries and can be carried and discharged in any position.

OVERSEAS ELECTRICAL TRADE

Declines in Both Imports and Exports During July

AS Great Britain's overseas trade as a whole showed a substantial improvement during July, it is somewhat disturbing to discover that both imports and exports of electrical apparatus and machinery were considerably smaller than they were in the corresponding month of last year. Exports at £1,581,973 were no less than £215,838 below the July, 1938, figure, the decline being mainly attributable to a decrease in purchases of electrical machinery. Switchgear exports in particular amounted to only £154,049 in value, as compared with £228,941. Smaller decreases were also recorded in all other classifications of electrical machinery export, with the exception of rectifiers for power-house use.

In the goods and apparatus section a decline of £67,674 in exports of telegraph and telephone apparatus (other than radio) was to some extent offset by an improvement in sales of "other insulated wires and cables." This improvement was due largely to increased purchases by Australia and South Africa, as the following analysis of the figures for July, 1939 and 1938 (in parentheses) shows:—

Rubber-insulated wires and cables:—Australia, £55,527 (£30,153); South Africa, £24,480 (£17,577); British India, £17,220 (£15,731); New Zealand, £9,474 (£8,579); other British countries, £20,151 (£21,535); and foreign countries, £9,928 (£25,221). Total, £136,780 (£118,786).

Electric wires and cables, insulation other than rubber:—Australia, £38,688 (£22,743); South Africa, £32,807 (£22,129); British India, £17,346 (£26,398); other British countries, £38,296 (£26,851); and foreign countries, £25,958 (£15,641). Total, £153,095 (£113,762).

The decline in purchases of telegraph and telephone apparatus was a fairly general one, though Argentina's share rose by £14,428. The complete analysis by countries is as follows, the July, 1938, figures being given in parentheses:—Australia, £53,302 (£93,674); South Africa, £35,008 (£36,893); other British countries, £40,619 (£70,077); Argentina, £36,296 (£21,868); and other foreign countries, £44,956 (£55,343). Total, £210,181 (£277,855).

TABLE I.—EXPORTS AND IMPORTS DURING JULY.

	Exports			Imports		
	July, 1939	Inc. or dec. compared with July, 1938		July, 1939	Inc. or dec. compared with July, 1938	
Submarine telegraph and telephone cables	£5,605	+	£1,293	*	—	
Telegraph and telephone wires and cables (not submarine)	49,474	—	17,890	*	—	
Other insulated wires and cables	289,875	+	57,317	£20,200	—	£21,599
Radio receivers, not radiograms (excluding valves)	19,530	—	14,873	13,700	—	1,294
Radio transmitters (excluding valves)	35,753	+	5,594	*	—	
Radio valves	25,079	—	15,780	16,256	+	5,528
Other radio parts and accessories	34,552	+	1,536	57,175	—	3,581
Telegraph and telephone apparatus (other than radio)	210,181	—	67,674	*	—	
Electric carbons	*		—	5,762	+	1,039
Incandescent lamps	50,614	+	7,979	9,253	+	341
Other lighting apparatus	65,756	+	23,443	30,812	—	5,928
Primary batteries	11,170	—	4,776	*	—	
Accumulators	19,280	—	27,619‡	*	—	
Electric cooking and heating apparatus	24,078	—	2,201	*	—	
House service meters	20,188	+	3,336	*	—	
Other electrical instruments (not telegraph or telephone)	25,744	+	3,183	27,136	—	3,073
Insulating materials not elsewhere specified	21,357	+	2,883	*	—	
Unclassified electrical goods and apparatus	126,448	—	2,150	64,839	—	1,695
Electric generators up to 200 kW	29,729	—	10,495	*	—	
Electric generators over 200 kW	73,105	—	19,346	*	—	
Electric motors	146,608	—	2,257	21,240†	—	3,279
Converting machinery	4,352	—	23,597	*	—	
Transformers for lighting, heating and power, including coils	63,499			*	—	
Rectifiers for power-house use	5,223	+	1,579	*	—	
Starting and controlling gear for motors	27,983	—	30,161	*	—	
Switchgear and switchboards (not telegraph or telephone)	154,049	—	74,892	*	—	
Other electrical machinery	14,792	—	1,290	14,615	—	5,864
Electric vacuum cleaners	27,249	—	8,980	14,659	—	3,002
Total	£1,581,973		—£215,838	£295,647		—£42,407

* Not classified. † Not railway and tramway motors.
‡ Values not completely comparable.

More Lighting Apparatus Exported

Lighting apparatus exports formed a bright corner of the market, shipments of both lamps and other apparatus recording advances. The improvement noticeable in the radio section as a whole during past months has not been maintained, though more transmitters and "other radio parts and accessories" were disposed of. Fewer batteries and accumulators were sold, and electric cooking and heating apparatus was also less in demand. On the other hand, exports of house service meters, "other electrical instruments," and insulating materials were all slightly higher.

Compared with June the total exports were £50,146 lower in value, the items showing the largest declines being generators of over 200 kW (£129,361 decrease) and telegraph and telephone wires and cables (not submarine) (£44,044 decrease). Classifications disclosing the biggest improvements were motors (£43,720 increase) and switchgear and switchboards (not telegraph or telephone) (£55,102 increase).

Turning to the imports of electrical goods and apparatus, the most striking feature was a reduction from £80,710 to £49,791 in the purchases from Germany. Slightly less, too, was bought from United States (£75,359, as against £81,508), Belgium (£11,099, as against £15,431), British countries (£13,151, as against £15,346), and "other foreign countries" (£16,127, as against £21,966). On the other hand, the Netherlands' share of the trade rose from £34,362 to £46,775 and both France (with £16,254, as against £11,983) and Switzerland (£16,577, as against £14,089) supplied more.

The classification accounting for the largest decrease was insulated wires and cables (not telegraph or telephone), imports of which fell £21,599 to £20,200. More radio valves, carbons and lamps were taken, but less other radio and lighting apparatus. Imports of all types of electrical machinery were lower.

TABLE II.—BRITISH ELECTRICAL IMPORTS DURING JULY.

Destination	Goods and apparatus, July, 1939	Inc. or dec. compared with July, 1938	Electric generators, July, 1939	Inc. or dec. compared with July, 1938	Electric motors, July, 1939	Inc. or dec. compared with July, 1938	Other electrical machinery, July, 1939	Inc. or dec. compared with July, 1938
Eire	£28,204	— £449	*	—	*	—	*	—
Channel Islands	15,543	+ 4,659	*	—	*	—	*	—
Palestine	7,805	— 2,783	*	—	*	—	*	—
British West Africa	11,431	+ 1,777	*	—	*	—	*	—
Union of South Africa	163,429	+ 66	£9,919	—£33,611	£21,925	—£18,801	£89,797	— £46,139
British India	91,051	— 22,909	12,490	— 30,785	16,510	— 1,532	61,749	— 17,674
British Malaya	38,621	+ 12,720	*	—	*	—	5,576	— 3,900
Ceylon	13,452	— 9,986	*	—	*	—	*	—
Hong Kong	12,074	+ 1,206	*	—	*	—	*	—
Australia	214,234	+ 8,201	9,377	+ 1,922	16,213	+ 213	17,183	— 7,198
New Zealand	67,229	— 30,866	*	—	3,861	— 2,172	16,353	+ 2,344
Canada	6,732	— 737	18,260	+ 14,259	3,439	— 2,827	1,090	— 8,469
Other British Countries	50,289	— 1,838	45,364	+ 30,295	55,750	+ 39,522	24,327	— 31,053
Soviet Union	5,279	— 14,403	*	—	*	—	*	—
Sweden	7,912	— 3,672	*	—	*	—	*	—
Denmark	12,023	— 6,684	*	—	*	—	*	—
Netherlands	14,573	+ 2,736	*	—	*	—	4,475	— 2,544
Belgium	7,985	— 3,145	*	—	*	—	*	—
France	19,549	+ 9,572	*	—	*	—	3,118	+ 714
Portugal	3,453	— 1,746	*	—	*	—	*	—
Spain	2,159	— 4,403	*	—	*	—	*	—
Italy	2,557	— 242	*	—	*	—	*	—
Greece	12,912	+ 3,117	*	—	*	—	*	—
Rumania	3,953	— 20,039	*	—	*	—	*	—
Egypt	31,564	+ 20,859	*	—	*	—	676	— 1,274
China	6,963	+ 3,377	*	—	*	—	7,952	+ 5,805
Brazil	10,056	+ 1,004	*	—	*	—	*	—
Argentina	77,576	+ 27,582	*	—	*	—	1,612	— 1,726
Other Foreign Countries	96,776	— 19,373	7,424	— 11,921	28,910	— 16,660	35,990	— 17,247
Total	£1,035,384	—£46,399	£102,834	—£29,841	£146,608	— £2,257	£269,898	—£128,361

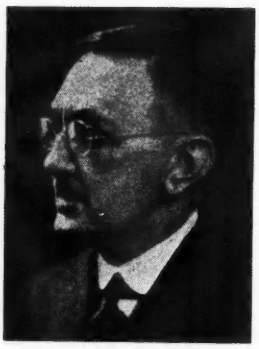
* Not classified separately. Vacuum cleaners are included in Table I but not in Table II.

PERSONAL AND SOCIAL

Information regarding new appointments and other matters of interest for this page are welcomed

THE following gentlemen have qualified to play in the London and Home Counties area final of the E.I.B.A. National Golf Competition at Sandy Lodge on September 1st: —Messrs. A. C. Ball, J. W. Bell, G. J. Berry, W. F. Bishop, J. Bunting, R. G. Cooper, J. T. Darch, A. E. Dawson, G. Falk, J. W. Fisher, L. S. Fosbrooke, H. P. Glaze, F. Giles, H. L. Hartley, J. Herd, T. W. Hills, P. V. Hunter, J. W. Jackson, W. Lang, J. W. Meares, D. H. Melhuish, H. E. Midgley, J. F. Morley, W. H. Mott, R. B. Paul, F. G. Quance, W. C. Smith, F. Spalton, C. Stewart, A. E. Taylor, A. L. Trundle, V. B. Twiss and C. F. Whitehead. There is a handsome array of trophies and prizes to be won, including the London and Home Counties Area trophy, presented by Sir Leonard Pearce; Area prize, Mr. J. Dalton; runner-up trophy, Surrey E.I.B.A. Committee; runner-up prize, L. G. Sloan, Ltd.; best scratch score prize, Mr. P. V. Hunter; four-ball competition prizes, Mr. P. L. Rivière; and the junior division trophy, Mr. J. H. C. Brooking. The day's play will end with supper at the club-house, at which the gentlemen who have presented the awards and other friends of the E.I.B.A. will be present.

Mr. R. V. Hall who, as we have already briefly announced, has been selected to succeed Mr. Forbes Mackay as general manager of the Sydney County Council electricity undertaking, was born in Sydney in 1878, and has been with the electricity undertaking for thirty-five years. The *Electrical Engineer and Merchandiser* states that he was educated at Sydney High School and graduated as bachelor of engineering at Sydney University. He entered the service of the undertaking as an assistant engineer and was sent abroad in 1907 and again in 1934 to study developments in electrical engineering practice. In 1909 he was appointed mains engineer and became distribution superintendent in 1917. From April to December, 1924, he was acting deputy general manager, and again from March, 1928, to February, 1929, when he was appointed assistant chief engineer, the title later being changed to assistant city electrical engineer. On the transfer of the electricity undertaking to the County Council, Mr. Hall was appointed chief engineer as from January 1st, 1936. As mains engineer he was responsible for the construction of underground and overhead mains, and as distribution superintendent for the development of the present transmission system. Mr. Hall is a foundation member of the Institution of Engineers, Australia, and an associate member of the Institution of Electrical Engineers, London. Mr. Forbes Mackay retires in October.



Mr. R. V. Hall

Mr. H. T. Stott, chief technician of A. F. Bulgin & Co., Ltd., has been elected to the board of directors of the company.

The trustees of the Miners' Welfare National Scholarship and Students' Exhibitions funds, have awarded scholarships to **Mr. J. McCallum,** of Shotts, Lanarkshire, tenable at the University of Edinburgh, for an honours degree course in electrical engineering, and to **Mr. J. Roberts,** of Healdswood, Notts, tenable at the Imperial College of Science and Technology, University of London, for a similar course.

Mr. A. G. Jones has resigned his position as sales manager of the Reliance Electrical Wire Co., Ltd., to take up a managerial post with Electrical Components, Ltd.

The Electrical Trades Union was formed in 1889 when electricity was in the experimental stage and was regarded dubiously by both masters and men. The first branch was formed in Manchester and its members were drawn mainly from electrical engineering firms who, in addition to manufacturing, did their own outside erection and installation. At that time electrical contractors, as now known, did not exist. The Union has experienced many ups and downs in its efforts to establish itself as a national organisation, but to-day with fifteen area offices in the charge of fifteen full time officials, and two national organisers attached to the general office, it has succeeded in building up an efficient administrative machine under the direct control of the National Executive Council.

This year it celebrates its jubilee and to commemorate the occasion, a dinner was held at Gatti's Restaurant, London, W.C., on Friday last, at which representatives from all parts of the country attended, under the chairmanship of **Mr. E. W. Bussey,** the general president of the Union.

The principal toast of the evening—"The Electrical Trades Union"—was proposed by Sir Walter M. Citrine, general secretary, Trade Union Congress General Council, who said he was proud that the E.T.U. had at last attained its lusty middle age. He referred to the early struggles of the Union, and said that it was a matter for pride that every day young people were coming forward with the same ideals as the founders. The history of the Union was one of sustained progress and it had now attained a position which made it a power in the land. Its membership to-day was 66,000. He paid tribute to the pioneers of the Union and to the work of the branch secretaries, and mentioned the biennial conferences which were becoming a more and more prominent feature of the Union's activities.

Mr. J. Rowan, general secretary, in responding, said that the power of the Union was second to none. The toast of "The Old Members" was proposed by Mr. Bussey, and replied to by Mr. J. W. Ball, vice-president. Mr. R. Prain proposed "The Chairman."

Mr. T. E. Shea, formerly of the Bell Telephone Laboratories, was elected vice-president of Electrical Research Products, Inc., at a recent meeting of the board of directors. Mr. Shea's appointment is effective as from August 7th. He becomes director of engineering and will have charge of all technical activities of the company in both New York and Hollywood. He succeeds Mr. H. G. Knox who resigned on July 15th for reasons of health.

Mr. C. H. Stafford, general manager of the joint transport undertaking of Burnley, Colne and Nelson Corporations, has been appointed transport manager by Leicester Corporation at a commencing salary of £1,250 a year. Mr. Stafford, who was in the "short list" for the Leicester managership in 1936, will have to complete the change-over of the Leicester transport system from trams to buses. Going to Burnley in 1930 from Reading, where he was deputy manager and chief assistant engineer of the transport undertaking, Mr. Stafford took an active part in the formation of the Joint Transport Committee in 1933. He supervised the rapid change-over from trams to buses.

Mr. E. Stewart, Glasgow inspector of lighting, is president-elect of the Association of Public Lighting Engineers, whose annual conference will be held in the city from September 4th to 8th. The Glasgow Lighting Department is arranging a special lighting display for the occasion.

OBITUARY

Mr. D. Hooper.—The death occurred recently as the result of a motor cycle accident, of Mr. Derek Hooper, of Electrocult, Ltd. Mr. Hooper, who was only twenty-four years of age, commenced his training as an apprentice with the West Cambrian Power Co., Ltd., leaving that company to take up the position of assistant manager to the Town, Aberdovey & District Electricity Co., Ltd. Later he joined the Stroud Electricity Supply Co., Ltd., which company he left to join Electrocult, Ltd., by whom he was appointed to take charge of the technical department last June.

The late Mr. D. Hooper

Mr. Herbert David Jackson, of Walsall, whose death occurred on August 7th at the age of sixty-two, was a director of George Turnock, Ltd., electrical fittings manufacturers, of Aston, Birmingham. He was a former president of the Walsall Chamber of Commerce.

Mr. W. H. Aish.—The death occurred on August 13th at the age of eighty-five, of Mr. William Hector Aish, founder of the firm of Aish & Co., Bournemouth. Mr. Aish began an ironmongery business in Bournemouth in 1885, and when a public electricity supply was commenced in the town he was one of the first to take up electrical installation work, and some of the earliest installations in the town were carried out by his staff. Mr. Aish took an active part in organising a local branch of the Ironmongers' Federated Association, and was its hon. secretary for many years. His son, Mr. Norman Aish, is chairman of the local branch of the Electrical Contractors' Association.

Mr. Anthony C. Crossley, M.P., who was among the five persons killed when a British Airways air liner burst into flames and crashed into the sea off Denmark, on August 15th, was the heir of Sir Kenneth Crossley, the chairman of Crossley Motors. He was thirty-six years of age and was a director of Crossley Brothers and of Crossley Premier Engines.

COMMERCIAL and INDUSTRIAL NEWS

Glasgow's E.D.A. Subscription. Illumination Design Courses. Lighting Fittings Factory. Electric Vehicles in Great Britain. Trolley Buses for Canada

Glasgow and E.D.A.

WITH reference to the question of renewing the Glasgow Corporation's subscription to the British Electrical Development Association, Glasgow Corporation Electricity Committee at its last meeting heard Mr. V. W. Dale, business manager of the Association. After discussion it was agreed that the Corporation's subscription to the Association for the year ending December 31st, 1939 (amounting to £1,406) should be paid, and that the question of the Corporation continuing its membership of the Association after that date should be considered following the appointment of the new committee in November next.

Illumination Design Courses

The success of the illumination design courses run in provincial centres by E.L.M.A. during the autumn of 1938 and the spring of this year has encouraged the Lighting Service Bureau to arrange an even fuller programme for this autumn. During October and November, design courses will be held in Edinburgh, Huddersfield, Leicester, Newcastle, Plymouth and Swansea, while tentative arrangements for Liverpool have been made. Invitations will be issued shortly in these areas, but as some who would like to attend may not be included in the mailing lists, application should be made to the E.L.M.A. Lighting Service Bureau, 2, Savoy Hill, London, W.C.2, for full particulars.

These educational lectures in the provinces are arranged for the benefit of those who are unable to attend London design courses, and are supplementary to the autumn design course which will be held as usual at the Bureau's London headquarters on six consecutive Monday evenings commencing October 16th. In nearly every case the London lecturers will speak in the provinces, and as far as possible the demonstration equipment used in the lecture theatre at Savoy Hill will be transported to the various towns concerned. The subjects to be dealt with will include illumination design, factory, shop, domestic and architectural lighting and electric lamps.

The dates for the various centres are as follows:—Edinburgh: October 3rd, 10th, 17th, 24th and 31st, and November 7th. Huddersfield: November 9th, 16th, 23rd and 30th. Leicester: October 10th, 17th, 24th and 31st. Liverpool (tentative): October 4th, 11th, 18th and 25th. Newcastle: October 12th, 19th and 26th. Plymouth: October 26th, November 2nd, 9th and 16th. Swansea: November 2nd, 9th, 16th and 23rd.

In addition, a special factory lighting slide-film and sound equipment will be available in each area to assist members of the electrical trade who are prepared to undertake lectures to local groups of industrialists.

Battersea A.R.P. Practice

During the London "black-out" test on August 11th the Battersea Borough Council Electricity Department took the opportunity of carrying out exercises in A.R.P. work. Mr. H. F. J. Thompson, M.I.E.E., the general manager and engineer, says that he was impressed by the manner in which the A.R.P. staff carried out their duties and that it is creditable to the men and to their instructor, Mr. A. W. Dunbar, the departmental A.R.P. officer. There are approximately 500 staff and employees and all are being trained in anti-gas and a proportion in first-aid and fire fighting; 118 have already qualified for A.R.P. certificates and badges, and of these twenty-four have obtained the British Red Cross and St. John Ambulance certificates. At Electric House a number of "fires" were dealt with by the fire squad on duty, and "casualties" were treated by the first aid party and conveyed to "hospital" in electric ambulances. Squads under the direction of an engineer were allotted various positions in the borough and on receipt of a telephone message went to deal with imaginary damage. Anti-gas and fire fighting uniforms were worn and the recognised equipment used, providing a realistic effect. There were a few minor defects shown up by the exercises, and these are being remedied. This goes to prove the value of such exercises.

Electricity at Royal Dublin Society's Show

A feature of the recent annual Horse Show of the Royal Dublin Society was a stand arranged by the Eire Electricity Supply Board. The display consisted of cooking and laundry equipment, suitable for hotels, hospitals and institutions, and frequent cooking demonstrations were given by a chef, one of which we illustrate.

Electric cooking display at the Royal Dublin Society's Horse Show arranged by the Eire Electricity Supply Board

Wages in the Cable-making Industry

The Joint Industrial Council for the Electrical Cable-making Industry announces that the August 1st cost of living figure (55 per cent. above the 1914 level) will not involve any alteration in wages on the third pay day in September.

Lectures for Engineers

The Yorkshire Council for Further Education has arranged a number of courses of lectures for engineers. The lectures, which are intended for qualified engineers, have been arranged largely on the basis of suggestions made by the Institutions of Electrical, Mechanical and Production Engineers, and will be given by specialists in contact with the practical problems of industry. They will be informal and discussion will be invited.

The courses include the following:—At Bradford Technical College, from September 27th for 25 weeks, a series of lectures on "Electric Traction," with Mr. D. A. Lightband, M.Sc. (Pittsburg), A.M.I.E.E., as lecturer. At Huddersfield Technical College, starting January 9th for ten weeks, lectures on "Gearing, Its Design, Manufacture and Performance," with Mr. W. A. Tuplin, D.Sc., A.M.I.Mech.E., of David Brown &

Battersea Electricity Department A.R.P. workers. Mr. A. W. Dunbar, the Departmental A.R.P. officer, is seated in the centre of the front row

Sons (Huddersfield), Ltd., as lecturer. At the Leeds College of Technology there is to be a course of eight lectures beginning January 10th on "Electrical Rectifiers," and the lecturer will be Professor E. L. W. Wheatcroft, M.A., Professor of Electrical Engineering in the University of Leeds.

In addition, a number of other courses are to be held at the Technical Colleges of Bradford, Halifax, Huddersfield, Leeds, Wakefield and York, starting in September next, and intended for men who hold a Higher National Certificate or similar qualification.

Electricity in Agriculture

Mr. E. M. Hood, Glasgow, area manager of the Electrical Development Association, spoke at Dunfermline on August 15th on the use of electricity in agriculture. He said that the vastly increasing use of electricity in agricultural work was evidence that the difficulties were being gradually overcome. Farmers were no longer thinking in terms of electric lighting only, but also of electric power for barn machinery, milking, and for miscellaneous uses. In milk production, the cleanliness and accuracy of control of electric heating was gradually superseding the traditional method of solid fuel heating. Particularly was this the case where accredited milk was produced, in which sphere the electric sterilising chest for dairy utensils was rapidly making a complete conquest.

Hotpoint water heater display by the Nottingham Corporation Electricity Department

Italian Institute of Electro-Acoustics

A National Institute of Electro-Acoustics has recently been inaugurated in Rome to carry on the work of the late Italian physicist, Signor O. M. Corbino.

Registered Electrical Contractors

The following applications for registration were accepted by the Executive Committee of the National Register of Electrical Installation Contractors at its meeting on August 11th: D. J. Spire & Co. (1935), Bourne, Lincs; Clayton Goodfellow & Co., Ltd., Blackburn; W. Draper & Co. (Electrical Installations), Ltd., 121, Victoria Street, London, S.W.1; T. Robinson (The Ark), Ltd., Edge Hill, Liverpool, 7; K. Munro & Sons, Ltd., Guernsey, Channel Islands; Silas D. Wilkinson, Ormskirk, Lancs; Clegg's, Grassington, Yorks; Arthur M. Hogg, Mossley Hill, Liverpool, 18; W. M. Grant & Co., 46, Peckham Grove, London, S.E.15; Miller Sign Co., Ltd., Liverpool, 1.

Research Subsidies in Belgium

The Belgian journal *Eclairage et Force Motrice* reports that during the financial year 1937-38 the National Research Fund granted a subsidy of 75,000 fr. to the Société Belge des Lampes à Incandescence "Luxor" to enable it to continue its experiments in ascertaining factors which govern the behaviour of incandescent filaments in electric lamps, one of 60,000 fr. to the Société La Soudure Electrique Autogène Arcos for electric arc welding research, and one of 60,000 fr. to the Société Electricité et Electromécanique for electric resistance welding research.

Employment in July

Employment in the engineering industry between June 12th and July 10th showed a further improvement in all the principal sections, and was very good in electrical engineering. According to the *Ministry of Labour Gazette* the number of unemployed in the engineering industry was 56,576, a decrease of 5,894, or 0.5 per cent., as compared with the preceding month, and a fall of 2.9 per cent. as compared with July, 1938. In electrical engineering the number out of work (3,556) represented a percentage of 3, which was 0.6 per cent. less than in the previous month, and 2 per cent. less than July, 1938. The unemployed in the electrical wiring and contracting industry totalled 4,118 (9.7 per cent.), an increase of 0.4 per cent. as compared with the month before but a fall of 2 per cent. as compared with July, 1938. In the electric cable, apparatus, lamps, &c., group the proportion of unemployed fell by 0.8 per cent. to 4.6 per cent. (7.5 per cent. in July, 1938).

Ideal Home Exhibition

The *Daily Mail* Ideal Home Exhibition for 1940 will be held at Olympia, Kensington, W., from April 2nd to 27th. Details of exhibiting space available are obtainable on application to the organiser, Mr. G. H. Grimaldi, *Daily Mail* Ideal Home Exhibition, New Carmelite House, London, E.C.4.

An Effective Window Display

During the recent showing at a local cinema of the George Formby film "Trouble Brewing" advantage was taken by the Nottingham Corporation Electricity Department to arrange a window display of Hotpoint electric hot-water heaters to "tie up" with the film. Our picture shows the effective use made of this theme.

The Paris Trade Fair

A general survey of the Foire de Paris, which was held from May 13th to 29th, shows that in the electricity group there was great activity on the stands of the exhibitors of electrical accessories and small appliances. As regards heavy material, the actual orders placed were not so numerous this year as on one or two previous occasions, but important contacts were made which promise big business at a later date.

"Show and Sell" Contest

The results of the *Daily Mail* "Show and Sell" contest have been announced this week. The winners of additional prizes offered by manufacturers include Meaders, Ltd. (winners of the £100 first prize in Section 3) who receive the first prize of £20 offered by Smith's English Clocks, Ltd., for an effective window display of "Sectric" electric clocks; Castleman Radio, who receive the first prize of £25 offered by Vactric, Ltd., for a display of their vacuum Cleaners, and Ely's (Wimbledon), Ltd., who are awarded the first prize of £25 by Williams (Birmingham), Ltd., for their display of "Atlas" flat base utensils.

Electric Vehicles in Great Britian

Interesting information concerning the use of electric battery driven vehicles and trolley-buses is contained in "The Motor Industry of Great Britain," just issued by the statistical department of the Society of Motor Manufacturers and Traders. This book has been adopted throughout the world as the textbook for those interested in the progress of the U.K. motor industry. The number of electric goods vehicles in use in Great Britain is stated to be 4,397, as compared with 3,320 in 1937 and 2,600 in 1936. New registrations of electric vehicles in 1938 totalled 907. The number of trolley-buses in use at the end of 1938 was 2,725 as compared with 2,125 in 1937, 1,588 in 1936, and 1,002 in 1934. New registrations in 1938 were 726.

Electric Clock Publicity

T.M.C.-Harwell (Sales), Ltd., will next month commence an intensive advertising campaign to promote the sales of "Temco" electric clocks. Advertisements will appear in the daily and provincial Press, and an attractive broadsheet is being issued to the trade. Our picture shows a display set which will also be available free to the trade. The main feature of the advertising will be "Father Time" taking the part of a gentleman of leisure, the headlines and slogan of the announcements—"Father Time leaves it to Temco—the current way of telling the time"—crystallising the theme.

A "Temco" display set

Trade Announcements

John Steel, engineers, of Bingley, Yorks, have recently moved into a large factory providing considerably more floor space. This has been made necessary by the steadily increasing demand for their "Impetus" range of products, and will enable the manufacturers to speed up production and deliveries. The address is still Clyde Mills, Bingley, Yorks.

Simmonds Aerocessories, Ltd., have appointed Mr. W. N. G. Phillips as their representative in the Midlands, covering the sales to manufacturers for commercial purposes.

The British Aluminium Co., Ltd., will be removing its head office from Adelaide House, King William Street, London, E.C.4, to new and larger quarters at Norfolk House, St. James's Square, London, S.W.1, as from September 18th. (Telephone: Whitehall 7822. Telegraphic address: "Cryolite, Piccy, London." Cables: "Cryolite, London"). This new head office will be the registered address of the company.

To cope with expanding business, B.E.N. Patents, Ltd., have opened a new service depôt and showroom at 92, Tottenham Court Road, London, W.1. (Telephone: Museum 9588.) The new branch is under the management of Mr. A. Kingwell, and carries a comprehensive stock of complete B.E.N. machines and spare parts. Demonstration facilities are also available.

New Lighting Fittings Factory

Production is now in full swing at the new factory into which Frederick Thomas & Co., Ltd., have recently moved at Everton Buildings, Stanhope Street, London, N.W.1. Not only will more ample accommodation be available—the new building has approximately twice the floor area of the old one in Drummond Street—providing the much needed space required to cater for the growing business, but it has enabled the company to reorganise its production on modern "flow" lines.

On the ground floor, besides offices, stores of both raw materials and finished products, and the despatch department, there are the brass shop, which is employed mainly for the turning, bending, screwing, tapping and assembly of standard articles; the polishing shop, equipped with dust extraction plant; the stove enamelling and lacquering shops; and the plating shop, where coppering, bronzing and silver plating are undertaken. Incidentally, in connection with spraying, stove enamelling is preferred to cellulose, every article receiving an undercoat, followed by stoving before the final enamelling and stoving.

The main portion of the first floor is laid out as one long room. At one end of this the metal spinning is carried out, the equipment being suitable to deal with any sized or gauge spinning up to 24 in. diameter. An annealing plant is provided. The other end of the room is used for handling sheet-metal work required principally in connection with special jobs, which, by the way, form a large part of the company's business. Offices, schools, hospitals and similar buildings account for much of the factory's output, and when we visited it recently we were shown some 4 ft. 6 in. by 2 ft. 6 in. floodlights being finished off for the Barking power station. In spite of their size, these are actually of small power compared with some of the floodlights made for the station, units as large as 8 ft. long having been produced. Also to be seen in process of construction was another speciality of the company, illuminated cabinets for viewing X-ray plates.

The directors' offices, drawing office, the sales and accounts departments and outside representatives' room are also housed on the first floor, while in the basement is a large showroom, not yet quite completed, where examples of all types of the company's extensive range of fittings will shortly be on view.

Marine Electrical Equipment

The International Marine Radio Co., Ltd., Connaught House, Aldwych, W.C.2, has now established a marine products department to deal exclusively with the supply and maintenance at sea of a wide range of electrical equipment. The new catalogue, which has just been issued, includes such equipment as totalisators, fire alarm systems, tools, generating sets and echo sounders.

Works Extension

Hague & McKenzie, Ltd., Birmingham, are making extensive additions to their works to cope with the increasing demands for "Pyramid" aluminium utensils for hot-plate cooking. A large bay is being added to the press shop to take a further battery of large double-action presses. The new bay will be a two-story building with the upper floor providing the extra room required for rough stores. During the excavations that are in progress, provision is being made for deep-shelter A.R.P. accommodation for the employés.

Export Lectures

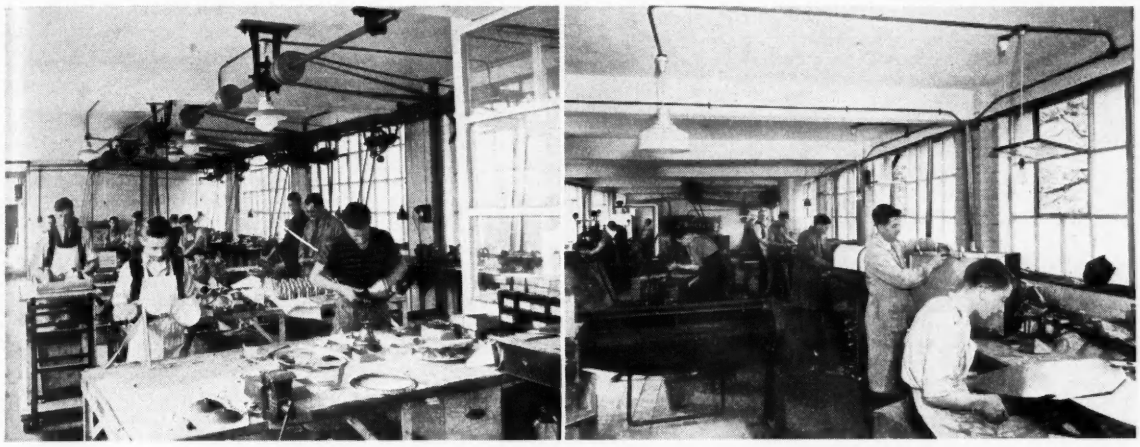
A series of weekly lunch-time market survey lectures arranged by the Institute of Export starts at the assembly room of the Royal Empire Society, London, W.C.2, on October 4th at 1.20 p.m. The Institute is also holding lunch-time lectures ("Syrett" series) at Carpenters' Hall, Throgmorton Avenue, E.C.2, commencing October 2nd. The market survey series is also being given in Birmingham at the Chamber of Commerce Building, starting on October 9th at 1.20 p.m., and other weekly lectures have been arranged at Manchester (Chamber of Commerce, Ship Canal House, commencing October 5th, 1.20 p.m.) and Liverpool (Chamber of Commerce, Old Hall Street, October 5th, 4.30 p.m.).

Electric Furnace Contract

For the new Redditch factory of High Duty Alloys, Ltd., Wild-Barfield Electric Furnaces, Ltd., have supplied three large vertical forced-air circulation furnaces for the heat-treatment of light alloys. The three furnaces, built for a maximum temperature of 550 deg. C., are identical in construction, and sunk in pits so that their tops are at ground level.

Each furnace takes a work basket 6 ft. internal diameter by 8 ft. 10 in. deep. The baskets are charged, discharged and quenched from the furnaces by a travelling gantry crane. The door of each furnace is of the roll-off type with hand-wheels for lifting and rolling, and incorporates a centrifugal fan 1 ft. deep by 4 ft. diameter driven through belting from a 10 HP slip-ring induction motor. A throat fitted below the fan engages with the furnace baffle when the door is shut. Between the baffle and the furnace walls are mounted the heating elements so that a directed air stream is provided, preventing radiation on to the charge from the elements. These are rated at 120 kW maximum, with provision for reduction by hand switching during soaking periods.

The temperature control and recording gear was made by Leeds & Northrup and comprise a single point indicating controller with a separate three-point recorder, the thermo-couples of which are spaced equidistantly down the work basket, thus giving a check on the actual temperature of the charge. Several safety devices are fitted to prevent damage to the furnace or charge. A variable thermostat with a non-return action prevents over-heating should the automatic controller fail; a door switch isolates the heating elements and fan motor when the door is lifted, and the switchgear incorporates the usual overload devices in the element and fan motor circuits.



Left: Assembly shop at Frederick Thomas & Co.'s new factory. Right: Sheet metal department

Norwegian Electrolytic Smelting Plant

According to the *Journal du Four Electrique*, of Paris, a scheme for the establishment of an electrolytic smelting plant near Glomfjord, Norway, is at present under consideration. The committee in charge of the project proposes to erect a Tysl-and-Hoie type of furnace with an electrical capacity of 12,000 kW, capable of producing about 30,000 tons of pig iron per year, and also an electric arc-type furnace for converting part of the iron to steel.

Prices of Materials

F. Smith & Co., report, August 23rd: Electrolytic copper bars, £51, 10s. increase. Ditto, ditto, wire rods, £55 10s., 10s. increase. Ditto, ditto, h.c. wire, $8\frac{1}{16}$d., $\frac{1}{16}$d. increase.

Henry Gardner & Co., Ltd., report, August 23rd: Copper bars (best selected), sheet and rod, no change. English pig lead, £18, £1 5s. increase. Spelter, £14 7s. 6d., 2s. 6d. decrease. English block tin and mercury, no change.

Edward Till & Co., report, August 23rd: India-rubber, Para fine, no change.

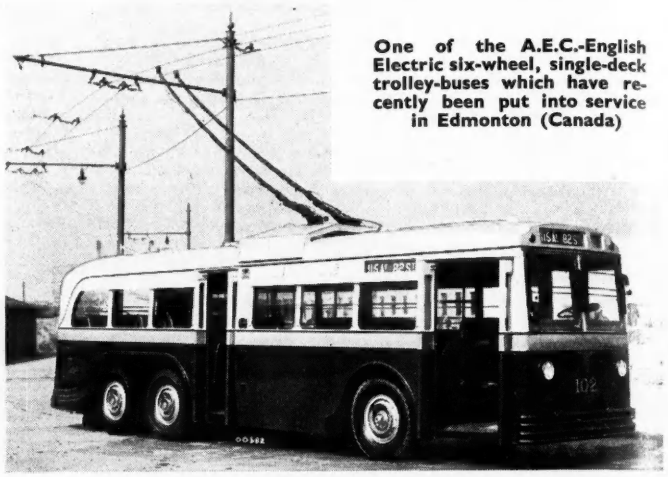
Trolley-buses for Canada

With the placing in service of three A.E.C.-English Electric six-wheel, single-deck trolley-buses Edmonton, Alberta, adopts this form of transport for the first time. Edmonton is the third city in the Dominion to replace trams by trolley-buses, the other two being Winnipeg and Montreal, of which the latter is also a user of vehicles made at Southall, England. The new vehicles are similar to those in Montreal, particularly in the inclusion of rear mounted control equipment. The severe climatic conditions of Edmonton have necessitated the provision of sanding apparatus. For this purpose the A.E.C. has chosen the Kenworthy gravity feed type, which is operated electro-pneumatically and placed before and behind all driving wheels. Air brake equipment includes the A.E.C. patented combined reservoir and control unit. A 5-cu. ft., two-cylinder compressor unit operated by a 500-V, 1-HP motor maintains air at a pressure of 85 lb. per sq. in.

The 115-HP English Electric motor is mounted amidships on "Floatex" rubber suspension from a tubular sub-frame and cross members. The electrical control equipment is housed at the rear of the frame in the form of a complete unit.

Designed to seat thirty-eight passengers, the body has been built by the English Electric Co., Ltd., and is of the all-metal type. For ventilation there are six ventilators of the "Air-Vac" pattern fitted in the roof. The electric lighting and auxiliary equipment is of a comprehensive nature deriving power from a 30-V generator and battery.

Since these trolley-buses will have to work in exceptionally cold conditions, particular attention has been paid to interior warmth, and twenty "Torribar" electric heaters have been installed. Eighteen of these are beneath the seats of the saloon, the remaining two being in the cab under the control of the driver. Each element is rated at 100 V, 250 W and the two elements in each heater are wired on separate circuits. To prevent the formation of frost the windscreen is also provided with two heaters rated at 200 V 125 W.



One of the A.E.C.-English Electric six-wheel, single-deck trolley-buses which have recently been put into service in Edmonton (Canada)

Dutch Electrical Imports and Exports

From the Dutch official trade returns for the first half of this year we have compiled the appended tables showing the Dutch imports and exports of electrical machinery and cognate material. It will be seen that the imports show a decrease of £121,591, while the exports have advanced to the extent of £124,886. For the purpose of comparison we have added the sterling value, converting guilders at 8.8 to the £.

	IMPORTS				EXPORTS			
	January to June				January to June			
	1938		1939		1938		1939	
	Quantity	Value in 1,000 Guilders	Quantity	Value in 1,000 Guilders	Quantity	Value in 1,000 Guilders	Quantity	Value in 1,000 Guilders
Electric generators and parts ... tons	526	693	778	1,118	236	247	206	215
Electric motors and parts ... ... ,,	1,245	1,631	1,081	1,457	620	807	550	688
Radio sets and parts ... ... ,,	1,166	3,461	1,064	3,317	3,099	18,384	3,675	20,050
Telegraph and telephone material... ,,	1,527	3,141	1,680	3,257	57	176	52	181
Elec. vacuum cleaners and parts ... ,,	173	521	187	610	101	193	314	516
Electrical measuring instruments and other apparatus ... ... ,,	3,023	4,889	3,116	5,012	1,408	2,816	1,140	3,023
Elec. wires and cables ... ... ,,	7,582	2,594	4,259	1,828	4,992	2,152	3,151	1,328
Elec. lamps over 16 V ... ... No.	379,900	175	300,400	121	6,338,600	2,437	5,705,800	2,267
Elec. lamps under 16 V ... ... ,,	887,400	64	952,100	74	4,068,000	724	4,671,400	712
Other electric lamps ... ... —	—	37	—	25	—	681	—	608
Cycle lighting dynamos ... ... No.	37,343	72	71,932	139	58,767	152	45,980	119
Cycle lighting dynamo parts ... —	—	54	—	28	—	18	—	1
Cycle electric bulbs ... ... No.	166,699	467	32,318	89	23,449	71	19,086	57
Bulbs for electric lamps ... ... tons	161	109	111	70	742	700	1,034	893
Elec. and other refrigerating machines ... ... No.	2,434	314	1,663	207	39	4	16	3
Total guilders	—	18,222,000	—	17,152,000	—	29,562,000	—	30,661,000
Total at 8.8 guilders to £	—	£2,070,682	—	£1,949,091	—	£3,359,318	—	£3,484,204

Bread Baking by Electricity

Tests in the relative efficiencies of various types of baking ovens being made in Switzerland indicate that the thermal efficiency of a good electric oven is 64.3 per cent. Wood heated ovens gave 20.1 per cent., briquette heated ovens 14.55 per cent. and coal heated ovens 14.33 per cent. Tests made on a recent installation at Granges, comprising two 30-kW heat-accumulator ovens and a 3.4-kW water heater of 66 gal. capacity, indicated an average consumption of 0.216 kWh per lb. of bread baked. In certain tests the consumption went as low as 0.157 kWh per lb. The installation operates only between 9 p.m. and 7 a.m.

New Catalogues and Lists

Enfield Cable Works, Ltd., 296-302, High Holborn, London, W.C.1.—A net trade price list of "Enfield" wiring systems.

British Thomson-Houston Co., Ltd., Crown House, Aldwych, London, W.C.2.—A leaflet on A.R.P. lamps and equipment for emergency lighting.

Edison Swan Electric Co., Ltd., 145, Charing Cross Road, London, W.C.2.—A folder dealing with "Ediswan Extra-Life" batteries.

Bonar, Long & Co., Ltd., Princes Street Works, Dundee.—Publication No. P.T.5 describing underground mining type transformers.

Londex, Ltd., Anerley Works, 207, Anerley Road, London, S.E.20.—List No. 83, giving a summary of the company's manufactures.

A. Reyrolle & Co., Ltd., Hebburn-on-Tyne.—Pamphlets on air- and oil-break switches, plugs and fuses, including No. 1016/3 dealing with class "U" cartridge fuse links.

Bulpitt & Sons, Ltd., Swansea Works, Camden Street, Birmingham, 1.—A folder illustrating domestic appliances.

Holden & Brooke, Ltd., Sirius Works, Manchester, 12.—A complete catalogue (No. 400) giving a brief pictorial review of centrifugal pumps, feed water heaters, steam traps, oil separators, steam turbines and allied plant.

Venner Time Switches, Ltd., Kingston By-pass Road, New Malden, Surrey.—An unusual and particularly interesting brochure which, besides containing much technical information, includes a paper model of the dual coin meter with all working parts exposed, a coloured key indicating each of the 122 parts which make up the meter.

Jackson Electric Stove Co., Ltd., 143, Sloane Street, London, S.W.1.—A 20-page illustrated catalogue of electric fires.

Dubilier Condenser Co. (1925), Ltd., Ducon Works, Victoria Road, North Acton, London, W.3.—A catalogue of condensers and resistances.

Power Equipment Co., Ltd., Kingsbury Works, The Hyde, Hendon, London, N.W.9.—Publication No. 150 illustrating totally enclosed iron-clad industrial switchgear.

Simplex Electric Co., Ltd., 219, Tottenham Court Road, London, W.1.—An illustrated catalogue of electric fires.

C. M. Churchouse, Clarendon Works, Clarendon Cross, London, W.11.—Art catalogue of commercial lighting fittings.

Morphy-Richards, Ltd., St. Mary Cray, Kent.—A list of new season's electric fires.

Information Department

GENERAL inquiries from readers relating to sources of electrical goods, makers' addresses, &c., are replied to by our Information Department through the post. Inquiries should be accompanied by a stamped addressed envelope.

Our extensive records enable us to reply to most queries, but occasionally we ask for our readers' assistance in tracing names and addresses not known to us. We should be glad to have such information regarding the following:—

LINK washer.

ELECTRICITY SUPPLY

Glasgow Hospital Heating Scheme. Bulk Supply Negotiations at Scarborough. Future of Whitworth Undertaking. New Northern Ireland Power Station?

Acomb (Northumberland).—LOAN FOR PUBLIC LIGHTING.—The County Council has sanctioned a loan of £115 to the Parish Council for electric street lighting.

Arbroath.—CHEAPER STREET LIGHTING.—The Arbroath Electric Light and Power Co. has recided to make a reduction of 2½ per cent. in the charge for street lighting.

Ashbourne.—CHARGES REDUCED.—A recommendation by the Electricity Sub-Committee that electricity charges in the urban and rural areas should be reduced has been approved by the Council. There will be a reduction of ¼d. per kWh in the power rate and the lighting charge will also be lowered.

Birmingham.—SUB-STATION CONSTRUCTION.—The Electric Supply Department is to erect sub-stations at Colebank Road, Hall Green, and at Willard Road, Sheldon. The sub-station at Hatchford Bridge, Sheldon, is to be extended.

Bournemouth.—SUPPLY TO FLATS.—The Housing Committee has arranged for the Bournemouth and Poole Electricity Supply Co. to install electricity at Ripon Road flats at a cost of 15s. per flat.

Blackpool.—LOANS.—Application is being made by the Electricity Committee for permission to borrow £36,000 for transformers and switchgear, £6,000 for mains and £11,000 for the conversion of consumers' apparatus.

Caernarvon.—PROPOSED SUB-STATIONS.—The Town Council is to construct sub-stations at Ty Coch and Llys Meirion, at an estimated cost of £2,750.

Chesterfield.—APPLICATION FOR RURAL SUPPLY.—The Brampton Parish Council has asked the Corporation for a supply of electricity to the parishes of Wadshelf, Wigley, Freebirch and Eastmoor, but the electrical engineer states that the Parish Council is still unwilling to allow the Corporation to erect overhead lines. The Electricity Committee has agreed to accede to the request if it is permitted to supply also the village of Cutthorpe and consent is not withheld to the erection of overhead lines.

Chingford.—SODIUM LIGHTING.—At Chingford, which became a borough last September, extensive street lighting improvements covering all the main roads have recently been completed. The scheme was planned by the Northmet Power Company, to comply with the Ministry of Transport's recommendations for Group A traffic routes. It provided for 127 140-W "Philora" sodium lamps, and the first 53 lamps were put into service last December. The whole of the scheme has recently been completed, replacing some 104 gas lanterns with which the majority of the main roads in the district were formerly lighted.

The equipment for the new lighting comprises fluted steel columns and "Golden Ray" fittings, and a feature of particular interest is that the brackets terminate in an adjustable head so that the fittings can be lined up parallel with the road surface. This arrangement is a distinct advantage where the roads have an appreciable camber and/or gradient. The fittings, which were manufactured by the Engineering & Lighting Equipment Co., Ltd., St. Albans, incorporate a special design of refractor plate combining horizontal and vertical prisms, thus ensuring a non-axial distribution with the greatest possible amount of light directed on to the road surface. Further extensions of the scheme are contemplated, and improvements have already been made in some of the side street lighting by installing new equipment, using a smaller size of "Philora" sodium lamp.

Sodium lighting in Larkshall Road, Chingford

Clitheroe.—SUPPLY TO HORTON-IN-CRAVEN.—The chairman of the Electricity Committee has reported on negotiations for a supply of electricity to Horton-in-Craven and on the guarantee which has been received. Subject to loan sanction being obtained from the Electricity Commissioners a supply is to be given to the district.

Girvan.—STREET LIGHTING.—The Town Council has adopted a recommendation of the Lighting Committee to invite tenders for lighting a number of streets by electricity.

Glasgow.—HOSPITAL HEATING.—A report by the city engineer with regard to the heating installation at Cowglen Hospital is under consideration. The Health Committee recommends the installation of an electrode boiler.

Heywood.—PURCHASE OF METERS.—The Town Council is applying for sanction to borrow £3,230 for meters.

London.—BATTERSEA.—The Electricity Commissioners have approved an extension of the Council's generating station at Lombard Road. The new plant will consist of one 30,000-kW turbo-alternator and two boiler units of 180,000 lb. of steam per hour, and the necessary buildings. The estimated cost will be approximately £400,000. The plant is required for use by the summer of 1942.

ST. MARYLEBONE.—The provision of a second point of supply from the C.E.B. at Aybrook Street at a cost, with the necessary switchgear, of £208,100 has been recommended by the Electricity Committee.

Middlesbrough.—EXTENDED SIMPLE HIRE ARRANGEMENTS.—The Town Council is to extend its hire system to include storage water heaters and electric wash boilers with wringers attached.

North Wales.—SUPPLY EXTENSIONS.—The Electricity Distribution of North Wales & District, Ltd. (Rhos), is to extend its mains to Bryngwym, Tanycoed and Ceunant.

Reading.—SUPPLY TO ESTATE.—The Town Council is to afford a supply of electricity to a proposed estate in Bath Road, Calcot.

Scarborough.—BULK SUPPLY.—The Town Council has decided to take no further action at present with regard to the suggested termination of the agreement with the Central Electricty Board for the supply of electricity to the Council's undertaking. The Board is to be asked to amend the existing agreement. The Council proposes to commence negotiations with the Buckrose Light & Power Co., Ltd., with a view

Public Lighting in Salisbury

THE question of improving the public lighting in Salisbury was brought under review in 1937, when it was realised by the City Council that the existing street lighting, particularly in the main traffic routes, was wholly inadequate for modern traffic conditions.

The city engineer, Mr. S. R. Little, thereupon made a complete survey of the public lighting of the whole city, calling into consultation the Salisbury Electric Light & Supply Co., Ltd., who, with the collaboration of Holophane, Ltd., produced a comprehensive scheme based upon the recommendations in the Ministry of Transport Departmental Committee's Final Report on Street Lighting. The scheme eventually adopted by the Council for immediate execution dealt with the lighting of all trunk and classified traffic routes, and this has now been completed.

After a number of existing installations had been inspected it was decided to employ 140-W sodium lamps in conjunction with the latest Holophane "dual" prismatic refractor panel lanterns, the sodium lamps with their associated electrical gear being supplied by Philips Lamps, Ltd., and the Edison Swan Electric Co., Ltd.

The choice of columns was the subject of careful thought, and eventually it was decided to adopt a special design of reinforced concrete column by the Stanton Ironworks Co., Ltd., as being most suited both to the ancient architecture to be found along much of the route and also the more modern sections in the residential areas on the outskirts of the city.

For controlling the lamps the DC bias system, developed by Standard Telephones & Cables, Ltd., is employed. The principle consists of the application of a low-voltage DC bias between phase lines and neutral, and the employment of polarised relays in each lamp pillar which respond to this bias. Supply to the street lamps is given from twelve transformer sub-stations, at each of which a control panel is erected. The entire system is controlled centrally from a remote control panel at the generating station and Post Office telephone wires are used to transmit impulses from the generating station to operate the contactor panels at the sub-stations. The system is capable of extension to other services such as air-raid alarms, firemen's call bells, off-peak load control, &c.

The new installation is being formally inaugurated by the Mayor of Salisbury to-day (Friday).

to entering into a new agreement regarding the bulk supply of electricity from the Corporation to the company.

SPECIAL DOMESTIC TARIFF.—On the recommendation of the borough electrical engineer the Town Council has decided to introduce an equated rate for small domestic consumers for combined lighting and cooking supplies. The rate will apply to premises with a total floor area not exceeding 1,200 sq. ft.

Stockton-on-Tees.—MARKET LIGHTING.—The Town Council is to spend £100 on electric lighting at the south end of the covered market.

Stoke-on-Trent.—FRINGE ORDER.—The Electricity Committee has obtained a Fringe Order to supply premises at Ball Green and Norton.

Walsall.—NEW SUB-STATION.—The Electricity Department is to erect a sub-station in Bentley Lane, near Wolverhampton Road.

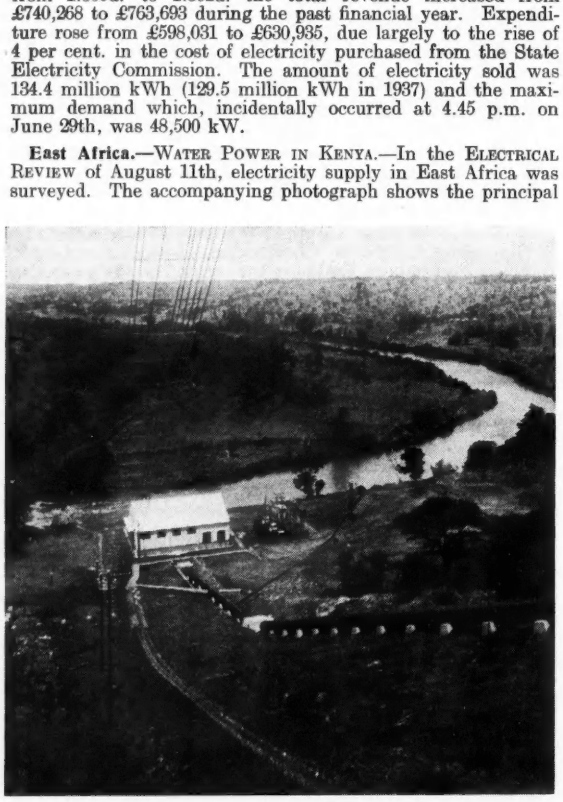
Watchet.—ELECTRIC STREET LIGHTING.—The Urban District Council has accepted the quotation of the Minehead Electric Supply Co., Ltd., for a ten year contract for street lighting at £228 per annum.

Whitworth.—FUTURE OF UNDERTAKING.—The Urban District Council has decided to refer back to the Electricity Committee a proposal that the Rochdale Corporation and the Lancashire Electric Power Co. should be asked to state on what terms they would be prepared to take over the Whitworth electricity undertaking. Concerning the proposal to negotiate with the Rochdale Electricity Department for meter testing to be done on the Whitworth Council's behalf, it has been decided to defer discussion pending the outcome of negotiations. Councillor Kershaw, who is chairman of the Electricity Committee, said that Rochdale Corporation offered amended terms for the bulk supply of electricity and he and the engineer were instructed to go to Rochdale to see if a further modification of the terms could be obtained. It was agreed that there should be a special meeting of the Electricity Committee on September 19th.

Overseas

Australia.—MELBOURNE.—Despite the abnormally dry weather and the reduction in the average revenue per kWh sold from 1.305d. to 1.301d. the total revenue increased from £740,268 to £763,693 during the past financial year. Expenditure rose from £598,031 to £630,935, due largely to the rise of 4 per cent. in the cost of electricity purchased from the State Electricity Commission. The amount of electricity sold was 134.4 million kWh (129.5 million kWh in 1937) and the maximum demand which, incidentally occurred at 4.45 p.m. on June 29th, was 48,500 kW.

East Africa.—WATER POWER IN KENYA.—In the ELECTRICAL REVIEW of August 11th, electricity supply in East Africa was surveyed. The accompanying photograph shows the principal



The Tana River hydro-electric station, Kenya

hydro-electric station in Kenya, the Tana River plant of the East African Power and Lighting Co., Ltd. Designed and constructed by Balfour, Beatty & Co., Ltd., the station contains 4,000 kW of generating plant, the turbines operating under a head of 248 ft.

Eire.—E.S.B. AND FISHERIES.—Under the Shannon Fisheries Act, 1938, the Electricity Supply Board is given power to control all the fisheries in the river and its tributaries. The Board has decided to make a complete survey of the river for the purpose of identifying the various fisheries and the owners of the fishing rights. A certain amount of scientific control is to be exercised over the restocking of the river which the Board is undertaking.

France.—WATER-POWER RESOURCES.—Interesting facts about the production and consumption of electricity have been given by Monsieur A. de Monzie, Minister of Public Works. As regards water power, the Minister has revealed that present installations represent approximately 3,800,000 kVA, corresponding to about 1,500,000 kVA normally utilisable. The total water-power resources of France have been estimated at 5,000,000 kVA normally utilisable, but this includes a number of schemes which, for the present at least, are not economic. Work on the development of hydro-electric power now under way includes a plant at Genissiat where the River Rhone has been diverted and the construction of a dam begun.

TRANSMISSION LINES.—The Société de Transport d'Energie des Alpes, of Paris, has recently secured a concession for the construction and operation of an overhead 150-kV transmission line between a new transforming station to be established at Genissiat and the Palente transforming station at Besançon (Doubs), a distance of about 90 miles. The line will comprise three aluminium-steel conductors each having a sectional area of 250 sq. mm. and capable of transmitting 50,000 kVA. The Société d'Energie Electrique Alpine has also been authorised to proceed with the erection of a 30,000-V transmission line about seven miles in length between Sautet (Isère) and Saint-Firmin (Hautes Alpes). The line will comprise three copper conductors each having a sectional area of 72 sq. mm.

Northern Ireland.—NEW POWER STATION?—According to the *Belfast News-Letter* it is possible that a power station will be built to provide a supply in the event of the Harbour station being disabled. It is stated that a sub-committee of the Electricity Committee is meeting this week to discuss the matter. When the question was raised during a recent visit of inspection, Mr. F. H. Whysall, electrical engineer and general manager, pointed out that the Corporation already had an alternative plant at East Bridge Street. In the event of an auxiliary station being proceeded with he would like to see it built where they could berth a ship capable of bringing in 5,000 tons of coal at a time.

Switzerland.—PRODUCTION OF ELECTRICITY.—Figures for the production of electricity during the year ended September 30th, 1938, have now been published. They show that 7,054 million kWh was generated, an increase of 197 million kWh (3 per cent.) over the preceding year. Nearly all (99.5 per cent.) was generated at hydro-electric stations. Two additional plants, one at Reekingen and one at Verbois, are now under construction and will add about 10 per cent. to the present production capacity of the country. The beginning of work on a further new plant at Oberhasli is projected for 1940. Of last year's total output 13 per cent. was exported.

TRACTION

Cardiff.—TROLLEY-BUSES.—The Transport Committee has asked the manager to make inquiries regarding different types of trolley vehicles. These are required to take the place of the trams.

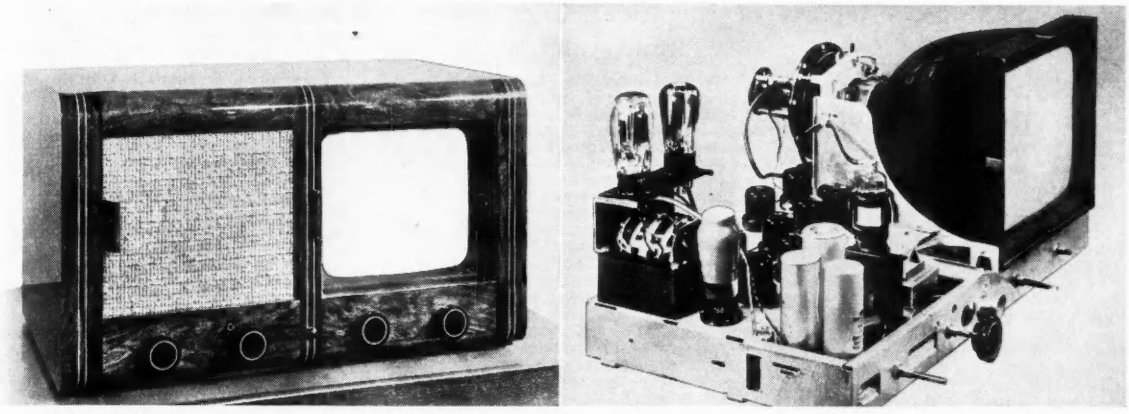
France.—NEW RAIL COACHES.—The *Revue Générale des Chemins de Fer* gives details of two new rail coaches recently constructed by the Als-Thom Co., Paris, the feature of which is that they are designed to be used on both electrified and non-electrified lines. For use on the latter, power is supplied by two Ganz-type 250-HP Diesel engines which drive a 150-kW, 675-V generator which, in turn, drives the special double-purpose electric motors. When used on electrified sections of railway special fittings to enable the necessary power to be taken from the overhead conductors are brought into use. Trials with the new coaches on the railway between Tarbes and Bordeaux with the two systems of traction are stated to have resulted in a speed of 81¼ MPH being attained by the rail coach alone and about 78 MPH when drawing a trailing vehicle.

"Civils" to Visit U.S.A.

SOME time ago the Institution of Civil Engineers accepted an invitation from the American Society of Civil Engineers to participate in a British-American Engineering Congress in New York and to visit the World's Fair and various places of engineering interest. The party will sail from Liverpool this week-end, arriving at Boston on September 3rd. The Congress opens on September 4th in New York. On the evening of September 6th, a banquet will be held at the Hotel Waldorf-Astoria, at which there will be speeches by some prominent British and American engineers; these will be broadcast throughout the United States. A tour of Washington, Niagara, Hamilton, Toronto, Ontario and Montreal will follow.

The party of members and ladies numbers about 100, drawn not only from Great Britain, but also from India, Australia, South Africa, Nigeria, Iran and Palestine, under the leadership of Mr. W. J. E. Binnie, president of the Institution of Civil Engineers. It is thirty-five years since an official visit to America was made by a representative body of members of the Institution.

Glasgow.—TROLLEY-BUSES STILL BEING CONSIDERED.—The Transport Committee has asked the sub-committee on finance and works to ascertain and report whether any grant can be obtained from the Ministry of Transport for the conversion of the tramway system in Glasgow to trolley-bus working, the estimated capital cost and annual maintenance charges.



German television receiver

Italy.—MORE TROLLEY-BUSES.—The Italian journal *Elettrotecnica* reports that a fleet of thirty six-wheel, single-deck trolley-buses is being built by the Alfa-Romeo Co. for service in Rome, the electrical equipment being supplied by the Ercole Marelli Co.

Lancashire.—TRANSPORT AMALGAMATION PLAN.—The suggested amalgamation of the transport undertakings of Blackburn, Accrington and Darwen Corporations under one joint board, upon which representatives of the three towns would serve, was advanced a stage further by a conference lasting nearly three hours at Blackburn Town Hall last week. Messrs. Collins and Fearnley, two experts who have reported favourably on the scheme, attended the meeting at which there were 50 representatives from the three towns concerned, and amplified their report. It was eventually decided to leave the matter over pending the delegations' making individual reports to their Councils. The suggested amalgamation is on the lines of the one successfully carried through several years ago by the Burnley, Nelson and Colne Corporations.

Liverpool.—NEW TRAINS ON SOUTHPORT LINE.—Now on trial on the L.M.S. Liverpool-Southport electric line is a new type of train. The doors are of the fully automatic type and although composed of only three coaches the train will be equal in carrying capacity to an existing five-coach set.

IMPROVED FINANCIAL POSITION.—Continued improvement in the financial position of the Passenger Transport Department is revealed in the annual report of the general manager, Mr. W. G. Marks. This has been achieved in spite of large expenditure on new capital works, including the modernisation of rolling stock and extensions of the tramway system; in the past five years expenditure on such works has amounted to £1,396,821, but £596,564 has been repaid. Last year there was a net surplus of £158,392, of which £120,568 was derived from the tramways. The total tramway revenue rose from £1,450,689 to £1,503,586, while operating costs dropped from £1,245,818 to £1,233,537. Per car mile operating costs averaged 13.96d. against 14.33d. in the previous year, and total charges per car mile were 15.65d. (15.85d.). As indicating the extent of rolling stock modernisation during the last five years, it is shown that 336 new tramcars and 142 new motor-buses have been placed in service, and 308 tramcars and 87 buses have been scrapped. Further alterations to the remainder of the older tramcars are being carried out during the present year. With the linking up of the tramway at Garston and Mather Avenue *via* Island Road South in June, the five years' programme authorised in 1934 was practically completed. During this period 13.56 miles of single track permanent way have been laid, equal to 6.41 route miles.

COMMUNICATIONS

East Africa.—TELEPHONE LINE CONSTRUCTION.—According to *Foreign Communication News*, plans are being prepared for the establishment of an inter-urban telephone line to provide communication facilities between Kenya and Uganda, East Africa.

Germany.—STANDARD TELEVISION SET.—We are informed by a correspondent in Berlin that the German television industry has pooled patents and experience for the production of the first receiver to be placed on the market in Germany. The price is fixed at 650 marks. The five makers concerned are Fernseh A. G. (now an entirely German firm belonging to Zeiss-Ikon and Bosch, Stuttgart), Telefunken, Radio-Loewe, Tekade and Lorenz. These will jointly manufacture the sets of which five thousand will, it is claimed, be available by December and another five thousand will be made the moment these "show signs of selling." Television is, at the moment, restricted to Berlin. The receiving set has a 10 in. by 8 in. screen on the cathode-ray tube and that there have been various savings in valves and other apparatus to simplify construction. Thus only 11 valves are required to produce full effect, together with three separate rectifier valves. The time-base equipment is said to be novel, requiring only one valve and a transformer. The total consumption for television and sound is 150 W, of which the sound side takes 45 W.

Holland.—TELEPHONE COMMUNICATION PROGRESS.—The *Journal des Télécommunications* reports that at the end of 1938 there were 1,543 telephone exchanges in operation in Holland of which 340 were of the automatic type. The number of telephone subscribers in the country is given as 306,467, of whom 228,383 are connected with automatic exchanges and only 78,084 to those that are still manually operated. Including extensions, there are altogether 430,268 instruments in use, not including those in 3,659 public call offices.

Trading at Southend

LAST week the Southend-on-Sea Town Council further considered recommendations made by the Electricity Committee arising out of a report by the borough electrical engineer and manager (Mr. A. C. Johnson) on the financial position of the trading department of the electricity undertaking.

In the report the engineer reviewed the recent history of the undertaking, giving the reasons which led the Electricity Committee to inaugurate and develop direct trading with consumers. He pointed out that prior to the inauguration of trading the load factor of the undertaking for the two years ended March 31st, 1931, averaged less than 29 per cent. and considered it reasonable to assume that without trading the load factor in 1937-38 would have been 30.2 per cent., whereas actually it rose to 42.2 per cent. If the undertaking exercised the full trading powers authorised by the Electricity (Supply) Act, 1926, the combined balance sheet would be improved, as it was obvious that direct sales to consumers of fittings, wiring, lamps and accessories would form a source of considerable income without material addition to the overhead charges, and, in fact, the Department was not now taking full advantage of an experienced staff. As the number of new consumers connected annually was decreasing, future expansion would depend on electrification of the home and this could only be accomplished by low prices and a vigorous trading policy.

Because of anticipated annual improvements in the revenue account, he advised in September, 1938, that increases in tariffs were not justified. Since then, however, unforeseen and alarming advances had been made in the cost of fuel. There had also been a falling off in trade due to the crisis, building operations were practically at a standstill, and vacant premises had increased. He anticipated, however, that conditions would improve and that the average price of electricity would resume its downward tendency. A small financial loss on the trading department was inevitable, and any curtailment of trading would have a serious effect on output. The undertaking as a whole was in a sound financial position, with capital assets of £1,800,000 and an outstanding dept of £900,000. Reserve and unappropriated funds amounted to £140,000, notwithstanding aggregate contributions of £83,000 in aid of the rates.

Having regard to the views expressed by the Council at its July meeting the Electricity Committee withdrew two of its proposals for tariff revisions and substituted a recommendation that the prices of electrical energy for all supplies, excluding those through prepayment meters and under agreements subject to a coal clause, should be increased by 2½ per cent. The Committee resolved to re-submit recommendations that the rate for battery charging should be increased from 0.4d. to 0.5d. per kWh, with coal clause, and that the quarterly minimum charges under free hire installations A, C and D should be reduced from 25s., 15s. and 6s., respectively, to 15s., 12s. and 4s. It was suggested that further consideration should be given to the revision of tariffs at the end of March next. The alterations were approved by the Council.

FINANCIAL SECTION

New Companies. Returns of Capital. Debenture Charges. Bankruptcies and Liquidations. Reports of Electrical Companies. Dividend Announcements. Stocks and Shares

New Companies Registered

L. A. Evans, Ltd.—Private company. Registered August 14th. Capital, £1,000. Objects: To carry on the business of electrical engineers and contractors, &c. First directors: L. A. Evans, electrical contractor (chairman), and Mrs. G. Evans, both of 12, Coronation Road, Worle, Weston-super-Mare. Registered office: 17, Burlington Street, Weston-super-Mare.

Southwood Electric, Ltd.—Private company. Registered August 14th. Capital, £1,000. Objects: To carry on business as suppliers of electrical fittings and equipment, including wireless, &c. Permanent directors: E. H. Lane, 10, Carlos Place, W.1, and T. P. Bennett, 43, Bloomsbury Square, W.C.1. Registered office: 5, Southwood Parade, Sidcup Road, Eltham, S.E.9.

Cooper Perry Manufacturing Co., Ltd.—Private company. Registered August 14th. Capital, £210. Objects: To carry on the business of manufacturers of and dealers in electrical and mechanical goods and appliances of all kinds, engineers and merchants, &c. Permanent directors: Mrs. S. D. Perry, 8, Margaretta Terrace, S.W.3, R. M. Cooper, 72, Broadwick Street, W.1, and Arthur R. Perry, address not stated. Solicitors: Wainwright & Co., 9, Bush Lane, London, E.C.4.

Modern Ventilating Co., Ltd.—Private company. Registered August 4th. Capital, £100. Objects: To carry on the business of founders, smiths, metal workers, tool makers, manufacturers of ventilating and heating apparatus, electrical, hydraulic, gas and water supply engineers, &c. Directors: A. W. Mills, 53, New Broad Street, E.C., and Miss B. Harris, Oveys Farm, Cookham, Berks. Secretary: S. I. Simmons. Registered office: 53, New Broad Street, London, E.C.2.

Winston Vaughan, Ltd.—Private company. Registered August 17th. Capital, £5,000. Objects: To carry on the business of manufacturers, wholesalers, distributors and retailers of wireless and television instruments, gramophones, &c. Directors: W. Vaughan, Tall Trees, Hightrees Road, Reigate, Surrey; S. F. Putner, 135, Venner Road, S.E.26 and R. S. Yates, 48, Neville's Court, Dollis Hill, N.W. Registered office: 23, Cheapside, E.C.2.

Trolley Bus Sledge Collector Co., Ltd.—Private company. Registered August 15th. Capital, £1,000. Objects: To acquire the benefit of certain patents or inventions relating to improvements in current collectors for trolley-buses and other electrical road vehicles supplied from overhead wires, and to adopt an agreement with Inventio Patent Verwertungs A.G. Directors: W. H. Bacon, Rye Platt, Wilmslow, E. Helb, 72, Vilmos Czaszar ut, Budapest V, A. Groedel, Commandau, Roumania, N. M. Bacon, Fleetway, Dickens Lane, Poynton, J. de Fischer, 41, Katona, Tozsef utca, Budapest, and W. C. E. Bacon, Rye Platt, Wilmslow. Secretary: W. C. E. Bacon. Registered office: Ship Canal House, King Street, Manchester, 2.

Heala (Electro-Medical), Ltd.—Private company. Registered August 14th. Capital, £10,000. Objects: To acquire the business now or lately carried on as Heala, Ltd., and all or any of the assets of the proprietors in connection therewith, and to carry on the business of manufacturers' distributors in the United Kingdom and elsewhere of ray apparatus; to manufacture or sell high-frequency and diathermy apparatus, vibrators, infra-red ray apparatus, ultra-violet and violet-ray apparatus and all electro-medical apparatus and appliances, &c. Subscribers: S. Blythe, 31, Burcott Road, Purley, Surrey, and C. Sidgwick, 6, Shortlands Grove, Shortlands, Kent. Solicitors: Warren & Warren, 31, Bedford Row, W.C.1.

W. T. Scutt & Co., Ltd.—Private company. Registered August 16th. Capital, £2,000. Objects: To carry on the business of electrical contractors, engineers, merchants, factors and wireless manufacturers and merchants, mechanical and motor engineers, &c. Directors: W. T. Scutt, 5, York Mansions, York Road, Edgbaston, Birmingham, and J. S. Rogers, 3, Hollies Court, Holly Road, Edgbaston, Birmingham. Registered office: 6, Livery Street, Birmingham.

L. Lowe (Nottingham), Ltd.—Private company. Registered August 16th. Capital, £2,000. Objects: To carry on the business of factors, manufacturers and repairers of and dealers in electrical goods of all kinds, dynamos, motors, armatures, magnetos, batteries, &c. Directors: L. Lowe (permanent) and Mrs. F. Lowe, both of 5, Shepperson Street, Nottingham. Registered office: 5, Shepperson Street, Nottingham.

J. R. Vernham, Ltd.—Private company. Registered August 16th. Capital, £1,000. Objects: To carry on the business of manufacturers of and dealers in lamps, lampshades, lamp standards, pedestals, electrical apparatus and wiring, and radio, television and cinematograph apparatus, &c. Subscribers: E. C. Davis, 36, Whitehall Park, Highgate, N.19, and H. J. Crimmin, 102a, Tudor Drive, Morden Park, Surrey. Solicitors: Maxwell Batley & Co., 88, Leadenhall Street, E.C.3.

Chromora, Ltd.—Private company. Registered August 18th. Capital, £1,000. Objects: To carry on the business of manufacturers of, agents for and dealers in electric, gas and oil lamps, quartz lamps, reflectors, bells, fires, stoves, &c. Directors: J. W. Harper and B. Harper, both of 31, Braeside, Beckenham, Kent. Secretary: R. F. C. Baker. Registered office: 12/14, Arthur Street, E.C.4.

H. Fisher (Oldham), Ltd.—Private company. Registered August 18th. Capital, £500. Objects: To carry on the business of manufacturers of, agents for and dealers in radio-gramophones, gramophones and records, wireless and television sets, &c. Directors: H. Fisher and Mrs. F. M. Fisher, both of 104, Villa Road, Oldham.

Companies' Returns

Statements of Capital

Altrincham Electric Supply, Ltd.—Capital, £310,000 in 100,000 ordinary, 49,650 1st preference and 103,350 2nd preference shares of £1 and 228,000 deferred shares of 5s. Return dated June 7th. 100,000 ordinary, 45,000 1st preference, 63,350 2nd preference, and 228,000 deferred shares taken up. £155,350 paid on 75,000 ordinary, 45,000 1st preference, 10,000 2nd preference and 101,400 deferred shares, £110,000 considered as paid on 25,000 ordinary, 53,350 2nd preference and 126,600 deferred shares. Mortgages and charges at date of return, nil. Since registered: debenture and collateral mortgage, both dated July 19th, 1939, to secure £40,000.

Synclocks, Ltd.—Capital, £100 in £1 shares. Return dated June 23rd. 52 shares taken up. £2 paid, £50 considered as paid. Mortgages and charges nil.

Walter's Electrical Manufacturing Co., Ltd.—Capital, £18,000 in £1 shares. Return dated June 26th. 16,875 shares taken up. £6,875 paid, £10,000 considered as paid. Mortgages and charges nil.

Langton & Young, Ltd.—Capital, £600 in £1 shares. Return dated June 24th. 167 shares taken up. £167 paid. Mortgages and charges, nil.

Delhi Electric Supply & Traction Co., Ltd.—Capital, £200,000 in £1 shares. Return dated June 14th. All shares taken up. £121,000 paid, £79,000 considered as paid. Mortgages and charges nil.

Hope's Heating & Lighting, Ltd.—Capital, £50,000 in £1 shares. Return dated June 20th. 27,000 shares taken up. £12,737 paid, £14,263 considered as paid. Mortgages and charges nil.

Llangollen & District Electric Light & Power Co., Ltd.—Capital, £6,000 in 2,500 preference and 3,500 ordinary shares of £1. Return dated June 14th. 360 preference and 1,753 ordinary shares taken up. £2,113 paid. Mortgages and charges: £1,500.

Whitehall Electric Investments, Ltd.—Capital, £7,500,000 in £5,000,000 ordinary stock and £2,500,000 preference stock. Return dated June 20th. All stock taken up. £2,500,007 paid, £4,999,993 considered as paid. Mortgages and charges nil.

W. T. Glover & Co., Ltd.—Capital, £500,000 in 100,000 preference and 400,000 ordinary shares of £1. Return dated April 6th. 100,000 preference and 344,550 ordinary shares taken up. £117,000 paid, £327,550 considered as paid. Mortgages and charges nil.

Mortgages and Charges

Holdgate & Commin (Electrolier), Ltd.—Debenture, charged on the company's undertaking and property, present and future, including uncalled capital, dated August 8th, 1939, to secure £400. Holders: Branch Nominees, Ltd.

Industrial Electrical Co., Ltd.—Debenture charged on the company's property, present and future, including uncalled capital, dated August 1st, 1939, to secure £500. Holder: Miss M. Withall, 15, Highbury New Park, N.

Celestion, Ltd.—Mortgage on land in Chessington, Surrey, dated August 2nd, 1939, to secure £6,000. Holders: Chessington & Moor Lane Estates, Ltd., 34, Market Place, Kingston-on-Thames.

Bill Switchgear, Ltd.—Charge on freehold land and factory in Aston Lane, Perry Barr, Birmingham, dated January 25th, 1937, to secure £10,000. Holders: W. G. Baines, 87, Handsworth Wood Road, Handsworth Wood, Birmingham, and others. (Registered August 10th, 1939, by permission of the Court.)

Plymouth Re-diffusion Service, Ltd.—Satisfaction to the further extent of £22,500, on July 10th, 1939, of debenture stock authorised January 8th, 1835, and registered January 21st, 1935, securing £50,000.

Company Liquidations

McEwan & Co. (Brighton), Ltd., lately trading as wireless and electrical factors, at Hove, Brighton.—A meeting of the creditors was held on August 18th at Winchester House, Old Broad Street, London, E.C., when it was reported that the company had gone into liquidation and had nominated Mr. N. W. Osborne, C.A., Finsbury Square, London, E.C., as liquidator. The statement of affairs showed ranking liabilities of £7,510. The net assets were £626, leaving a deficiency, as regarded the creditors, of £6,884. Mr. Osborne reported that he was appointed as receiver by the debenture holder, Mr. McEwan, in June of last year. As receiver he continued the business until April, when he disposed of the stock, fixtures and fittings. It was decided that the voluntary liquidation should be continued with Mr. Osborne as liquidator. A committee was also appointed.

De Carle & Son (Norwich), Ltd., Rose Yard, St. Augustine's, Norwich, electrical dealers, &c.—The statutory meeting of the creditors was held recently at Norwich, when Mr. L. H. Helyar, a director of the company, occupied the chair. The statement of affairs disclosed liabilities totalling £1,581. The net assets were £663, leaving a deficiency, as regarded the creditors, of £918. It was decided that the voluntary liquidation of the company should be continued with Mr. C. Latham, of 185/8, High Holborn, London, W.C., as liquidator, with a committee of three of the creditors.

Day's Radio, Ltd.—Meeting August 23rd at 185-188, High Holborn, London, W.C.1, to receive a report of the liquidator's investigations and to inaugurate a fund to enable the liquidator to employ solicitors and counsel to take such

proceedings as may be advised for the benefit of the creditors and the trade generally.

Psychon Radio, Ltd.—Meetings September 22nd at 185-188, High Holborn, London, W.C.1, to receive an account of the winding-up by the liquidator, Mr. C. Latham.

Beard & Son, Ltd.—Winding up voluntarily. Liquidator, Mr. C. F. Bland, 11, Sir Isaac's Walk, Colchester.

Bankruptcy Proceedings

W. L. Hughes, 15, Wickham Road, Beckenham, Kent, electrical engineer.—The receiving order was made on a creditor's petition recently and at the first meeting of creditors held on August 16th at 195-203, Waterloo Road, London, S.E.1, the statement of affairs disclosed ranking liabilities of £355 and a similar deficiency. The failure was attributed to loss on contracts during 1937 in consequence of unreliable workmen and to trade depression during 1938-9. The case being a summary one was left in the hands of the Official Receiver as trustee.

W. H. Macmillan, radio dealer, 21, Allport Lane, Bromborough.—Last day for receiving proofs for dividend August 28th. Trustee, Mr. P. S. Booth, 5, Rumford Place, Liverpool.

G. Hopkinson, radio engineer and wireless dealer, 84, Derby Road, Chesterfield.—First and final dividend of 3s. 9¾d. in the £, payable September 7th at 22, Regent Street, Park Row, Nottingham.

A. Rautanen, electrical, mechanical and wireless engineer, 17, Princes Street, Shrewsbury.—Application for discharge to be heard on October 16th at the Shire Hall, Shrewsbury.

R. J. Horton, electrical engineer, 204, Coldharbour Lane, Brixton, London.—Last day for receiving proofs for dividend September 14th. Trustee, Mr. C. Latham, 185-188, High Holborn, W.C.

F. F. C. King, radio trader, 235, Banbury Road, 55, High Street, 87, St. Aldates, and 226, Cowley Road, Oxford.—Last day for receiving proofs for dividend September 4th. Trustees, Mr. R. J. Pigott, 1-5, Broad Street, Oxford, and Mr. C. Latham, 185-188, High Holborn, London, W.C.1.

A. Lewsley (West Ewell Electrical Supplies), electrical engineer, 2, The Parade, Chessington Road, West Ewell, Surrey.—Last day for receiving proofs for dividend September 12th. Trustee, Mr. C. Latham, 185-188, High Holborn, W.C.1.

W. E. Watson and **C. A. Childs** (Watson & Childs), wireless and electrical engineers, 7, City Road and 5a, Southgate Street, Winchester, and at Salisbury, Fareham, Wickham and Andover.—Last day for receiving proofs for dividend September 30th. Trustee, Mr. C. Latham, 185-188, High Holborn, W.C.1.

Reports and Dividends

The Philco Radio & Television Corporation of Great Britain, Ltd.—The *Financial Times* reports that the company has made arrangements to secure temporary finance required in connection with other manufacturing work it is undertaking. The company states that Government and commercial contracts have been obtained sufficient to employ the factory capacity available, after maintaining a satisfactory volume of radio production in a high state of efficiency.

The Vera Cruz Electric Light, Power & Traction Co. reports operating revenues of £35,733 for 1938, as compared with £40,330 in the preceding year, and, after providing for expenses, debenture interest, &c., and net exchange loss on working capital, a deficit at December 31st of £98,769 (against £87,834). Sales of electricity totalled 11,551,000 kWh, an increase of 3 per cent.

The Tokyo Electric Light Co. reports a net profit of 18,353,286 yen for the half-year to May 31st, as compared with 18,352,802 yen in the corresponding period of 1938. The dividends are maintained at 8 per cent. per annum and 16,834,157 yen is carried forward (against 16,832,819 yen brought in).

The Pernambuco Tramways & Power Co. reports operating revenues of 34,608 contos for 1938, as compared with 32,857 contos in the preceding year, and operating expenses of 25,968 contos. The balance before taking account of other income, interest and depreciation is 8,640 contos. The balance for 1938 of £22,138 has been applied against the deficit existing at December 31st, 1937, leaving a deficit carried forward of £128,793. Due to restrictions on exchange, the company was unable to secure during the year sterling funds for payment of interest on the 5 per cent. first mortgage debentures.

The Compania de Electricidad de la Provincia de Buenos Aires reports a net profit for 1938 of £84,907, as compared with £98,386 for 1937. The reserve fund receives £6,560, and £3,000 is placed to other reserves. Dividends are maintained at 8 per cent. on the non-cumulative pre-preference, and 6 per cent. on the 8 per cent. non-cumulative participating preference shares. Sales of electricity increased by 7½ per cent. to 29,382,000 kWh.

The Southern Brazil Electric Co. reports a net revenue for 1938 of £8,973 before other income and fixed charges. Other income, consisting almost entirely of interest from subsidiary companies, amounted to £41,976. The balance carried forward in reduction of the deficit was £2,969, reducing the accumulated deficit to £318,433.

Ward & Goldstone, Ltd., have declared an interim dividend on the preference stock of 3½ per cent. actual (£3 10s. per £100 stock), less tax.

Waste Heat & Gas Electrical Generating Stations, Ltd., has declared an interim dividend of 2½ per cent. on the ordinary stock (same).

Swedish Electrical Trade

Further Progress

THE Swedish electrical export trade progressed further last year in all its more important departments and particularly in telegraph and telephone material, large contracts in which were executed for Poland and Finland. Import trade also increased except in radio apparatus, which fell off after a large advance between 1936 and 1937. Sweden, however, is still a much larger purchaser of radio material than an exporter. On balance, too, she is an importer rather than an exporter of wires and cables. Great Britain's share in supplying Sweden's electrical requirements, even in the last-named branch, is still meagre.

According to the latest census of industrial production the value of electrical machinery, apparatus and cables produced in Swedish factories in 1937 was 225,231,000 kr. against 111,309,000 kr. in 1932, 141,683,000 kr. in 1929, and 32,571,000 kr. in 1913.

The following table, based on the Swedish foreign trade returns, shows the value of imports and exports of the principal groups with chief countries of origin or destination last year, notes of increases or decreases on 1937 being added for purpose of comparison. (The exchange value of the krone is about 1s.)

IMPORTS	1938 Kr. (000)	Inc. or dec. on 1937 Kr. (000)
Batteries, accumulators and parts—		
Total	2,365	+ 88
From United Kingdom	392	− 88
,, Germany	990	+ 220
Radio apparatus—		
Total	11,695	− 6,058
From United Kingdom	1,276	− 794
,, Germany	3,469	− 541
,, Holland	4,020	− 2,390
,, United States	1,716	− 1,454
Motors, generators, convertors and transformers—		
Total	10,180	+ 1,019
From United Kingdom	625	+ 59
,, Germany	5,896	+ 346
,, United States	1,577	+ 517
Stators, rotors, current collectors, etc.—		
Total	1,007	− 8
From United Kingdom	70	− 12
,, Germany	607	− 99
Metal filament lamps—		
Total	2,426	+ 216
From Germany	1,040	− 3
,, Holland	582	+ 48
Carbon for electrical purposes—		
Total	3,457	+ 227
From United Kingdom	488	+ 16
,, Germany	1,440	+ 16
Regulating and control apparatus—		
Total	681	+ 61
From United Kingdom	36	+ 6
,, Germany	382	− 25
Switches, etc.—		
Total	4,530	− 340
From Germany	3,878	− 399
,, United Kingdom	74	+ 25
Electricity meters—		
Total	1,437	− 7
From Germany	1,205	− 111

Imports—*contd.*	1938 Kr. (000)	Inc. or dec. on 1937 Kr. (000)
Other electrical measuring instruments—		
Total	1,320	+ 42
From United Kingdom	109	+ 19
,, Germany	959	+ 23
Insulated wires and cables—		
Total	8,883	+ 1,022
From Germany	7,090	+ 755
,, United Kingdom	100	+ 4
X-ray apparatus—		
Total	671	+ 123
From Germany	614	+ 125
Vacuum cleaners—		
Total	1,820	+ 662
From Germany	1,395	+ 403

EXPORTS		
Motors, generators, transformers and convertors—		
Total	17,116	+ 472
To United Kingdom	987	+ 284
,, Germany	838	+ 493
,, India	1,158	+ 456
,, Italy	487	+ 191
,, Canada	375	− 409
,, Argentina	811	+ 180
,, Brazil	1,015	− 122
,, Australia	468	+ 78
,, Norway	1,372	+ 350
,, Finland	2,384	− 1,076
,, Denmark	422	− 96
,, New Zealand	350	+ 106
,, India	1,158	+ 455
,, British S. Africa	701	− 235
Vacuum cleaners—		
Total	9,913	+ 333
Accumulators, batteries and parts—		
Total	2,190	+ 83

Exports—*contd.*	1938 Kr. (000)	Inc. or dec. on 1937 Kr. (000)
Stators, rotors, etc.—		
Total	661	+ 110
To United Kingdom	135	− 22
,, Finland	85	− 49
Switches, etc.—		
Total	1,102	− 274
To United Kingdom	143	− 67
,, Finland	160	− 144
Telegraph and telephone apparatus—		
Total	10,577	+ 3,082
To Italy	432	+ 70
,, British South Africa	491	+ 12
,, Poland	1,596	+ 850
,, India	47	− 4
,, China	184	− 56
,, Finland	1,285	+ 308
,, Norway	619	− 80
Insulated wires and cables—		
Total	5,544	− 314
To United Kingdom	104	− 83
,, Mexico	1,012	+ 575
,, Poland	117	+ 6
,, Finland	767	− 37
,, Argentina	758	− 140
Metal filament lamps—		
Total	1,187	+ 169
To Denmark	84	− 9
,, Norway	34	− 34
,, Finland	63	+ 14
,, Turkey	226	+ 178
,, Argentina	406	+ 143
Carbons for electrical purposes—		
Total	708	+ 105
To Poland	127	+ 59
,, Norway	207	− 62
Radio apparatus—		
Total	1,786	+ 285
To Finland	1,045	+ 255
,, Brazil	30	+ 16
,, Argentina	10	+ 6
,, India	11	+ 1
,, Norway	176	− 44

STOCKS AND SHARES

TUESDAY EVENING.

STOCK Exchange markets have been further disgruntled by the announcement of a pact between Germany and Soviet Russia. Previously to this the markets were in none too happy a state, and the latest blow to confidence, which came on the Tuesday of this week, served to put down prices with a heavy hand. As may well be supposed, business dwindled to a minimum. The falls were distributed over most of the markets in the House. The obscurity of the outlook not only had the effect of restraining support, but brought in a certain amount of selling by holders fearful of what may occur in the event of matters being pushed to extremes. A rally from the lowest prices occurred before the close.

There are few outstanding features: in all departments the disposition is towards lower figures, due mainly, as already mentioned, to restraint on the part of prospective buyers so long as the political situation remains in its present state. The falls in Central Electricity and London Passenger Transport issues are evidence of the nervousness that affects holders of "money" stocks.

Equipment and Manufacturing

Notwithstanding the advantages which ordinary shares are supposed to have over gilt-edged stocks in circumstances such as those now present, the prices of each still move roughly in unison. Thus the electrical manufacturing market has considerable scars to show as a result of the disturbance in the early part of this week. Among the chief sufferers were English Electrics at 33s. 6d., Westinghouse Brakes at 47s. 6d., and Tube Investments at 87s. 6d., each with a loss of ¼. Associated Electricals lost 3s., to 38s., and there were falls of 1s. 3d. or more in General Electrics at 73s., Automatic Telephones at 45s. 9d., Henley's at 17s. 6d., Siemens at 22s. 6d., and others. Most of these prices, it is to be noted, are still above the levels touched on others of this year's crisis days. Further, it is reported that the extent of the setback exaggerates the amount of selling actually effected.

Cable Shares

Dullness in the prices of the leading cable manufacturers' shares has been for some time a subject of discussion in the electrical equipment market. Renewed attention has been called to the situation by the 5s. fall in the price of Callender's Cables shares during the past fortnight. At 61s. 3d. the quotation is only 1s. 3d. above the lowest price touched immediately after the disturbing announcement of this year's reduction in profits and dividends. Previously this year the shares had changed hands about 30s. higher. Enfield Cables at 48s. 9d. are also around the year's lowest point, and some 10s. below the top price. On the other hand, British Insulated shares—supported to some extent by bonus hopes—have borne up reasonably well. The same remark applies to the shares of Johnson & Phillips, Siemens and Crompton Parkinsons. For the weaker spots, a generally accepted explanation is the rise of competition from firms outside the Cable Manufacturers' Association. There is no lack of confidence in the strength of the C.M.A. organisation to maintain sound trading conditions for its members. For the time being, however, it is supposed that the competition is making its presence felt to some extent, particularly in the matter of prices. Not that the problem is considered as having the proportions of a serious threat: the shares continue to hold a high place.

High Yields

Lancashire Dynamo and Crypto shares, after this week's fall of half-a-crown, stand at 60s. On the basis of the 25 per cent. dividends paid in each of the past two years, the yield comes to 8⅓ per cent. Other high yields now shown by electrical manufacturing shares are the returns of 7¾ per cent. on Crabtree Electricals at 22s. 6d.; 8.1 per cent. on Ever Ready at 18s. 6d.; 8.3 per cent. on Switchgear and Cowans at 12s.; 8.5 per cent. on Walsall Conduits at 25s. 9d.; and 10 per cent. on Aron Meters at 30s. Yields of 6 to 7½ per cent. are plentiful enough, but the aristocrats of the market mostly pay less than 5½ per cent. on the money. In this latter category come Associated Electrical Industries at 38s., and General Electrics at 73s.

Inflation in the Air

Talk of inflation is so much in the air that a word on the matter, as it affects Stock Exchange securities, may be considered as being not out of place here. The theory that a period of inflation is in prospect points, on the one hand, to the approach towards full employment, as indicated by the dwindling unemployment figures; and, on the other hand, to the intention of the Government to borrow sums apparently much in excess of those usually available for investment. The argument runs that if the expansion of the arms programme is to continue—as it must—then the Government will find itself in competition with private enterprise for the labour and capital. In the absence of counter-measures, the result would be a rise in wages—and thence in costs and prices—and also in the rates at which money could be borrowed. Under these conditions, which would be called inflationary, experience has shown that the prices of "equities," or ordinary shares, rise along with other prices; while gilt-edged prices tend to weaken in conformity with the rise in interest-rates. It is freely admitted that the authorities have it in their power to check the development of matters on these lines. That the tendency towards inflation will be allowed some rope, however, is a leading argument used by the protagonists of "equities" in the case of ordinary shares *versus* gilt-edged.

Transport Uncertainties

The market in Home Railway stocks has been among the few in which the speculator has felt it worth while to chance his arm in recent months. Consequently the dispute over minimum wages has caused a small scramble, among the weaker holders, to get out. Pending the outcome, there has been little to tempt fresh buying. Prices have accordingly tended to shrink again this week, Southern 5 per cent. preference, at 82, for instance, being 6½ points down. This makes a loss of 11½ points since the beginning of the month. Level-headed opinion assumes that the railwaymen will scarcely run the risk of alienating all sympathy by strike action, at this stage of events, against the national interests. Few people are prepared to hazard a guess as to how the men's claim would fare through the ordinary channels of negotiation, to which the companies have offered to refer the dispute. The companies' answer to the claim, which would cost them upwards of one-and-a-quarter million pounds annually, is that the present improvement in traffic, being inspired largely by rearmament activity, cannot be regarded as sufficiently established to stand an increase in wages. London Transport "C" stock has fallen 4 points to 66½. Thomas Tilling at 47s. are ex dividend.

Canadian Investments

The trek of capital across the Atlantic, anxious to take refuge from the danger spots of Europe, finds some difficulty in obtaining a reasonable yield with first-class security. On American gilt-edged stocks, from which in any case the British investor is semi-debarred, the returns are almost absurdly low: and the returns on Canadian Government issues would seem inadequate without the enchantment lent by their distance from Europe. Interest has spread accordingly to the well-secured debentures; and, beyond that, to the preference and common stocks of industrial and utility companies, among which the big electricity undertakings have come in for particular attention. Sound stock is not easily come by. At the present, however, fair-sized lines are on offer of British Columbia Electric Railway 4½ per cent. debentures, at 96, to yield £4 9s. 9d. per cent., and a similar stock of Vancouver Power—which supplies electricity to the railway company—at 94½ to yield £4 10s. 3d. per cent. This issue is guaranteed by the railway company, whose last published profits covered the interest on its own debentures three times, and on the Vancouver Power stock twice. Both stocks are irredeemable, and to residents abroad the interest is paid without deduction

Radio Finance

News that the Philco Radio Company has secured temporary funds for financing other manufacturing work is further testimony to the way in which radio manufacturers are finding fresh employment for idle plant and equipment. Much of the latter must reach a very high standard of efficiency, and, while the radio trade remains in the doldrums, is evidently capable of adaptation to other purposes. Thus Electrical & Musical Industries are manufacturing a variety of domestic electrical appliances and are known to have important Government work on hand, while A. C. Cossor and other companies in the field have reported work on official contracts. For another example, electric lamps manufactured on mass production lines by E. K. Cole will soon be on the market.

Handicaps in Mexico

Some idea of the difficulties which British companies operating in Mexico experience in carrying on their business, can be gathered from the report of the Vera Cruz Electric Light Power and Traction Company. Last year the exchange broke badly. In 1937 the peso's average value was 1s. 2d.; in 1938 it fell to 11d., with the result that although the Vera Cruz Electric Company had an increase of 9 per cent. in earnings, the exchange turned it into a decrease of 11 per cent. in sterling. The loss for the full year was £4,800: the total deficit is now £98,300. Last January, 1½ per cent. was paid on the company's 5 per cent. bonds. Nothing has been distributed since, and the price of a £100 bond is about £9 middle. Mexican Light & Power bonds are quoted at 25—a very nominal price.

Miscellaneous Matters

Midland Counties Electric shares, with a rise of 1s. 3d. to 38s. 9d., have established themselves further as among the leaders in the electricity supply group, the yield of under 4½ per cent. being less than the returns on such "gilt-edged" shares as Scottish Power and Yorkshire Electric. In the same market, Bournemouth and Pooles at 62s. 6d. are ex dividend. Overseas light and power issues have generally held their own.

Cable and Wireless stocks have weakened, and transatlantic communication issues are mostly lower, with losses in American Tel. & Tel., at 172½, Internationals, at 6¼, Western Unions, at 23⅛ and Radio Corporations at 5⅞. The falls reflect the highly nervous state of Wall Street, whose reactions to events are still carefully watched for their influence on London markets. Vickers, at 16s. 6d., have fallen to the lowest price of the current year.

ELECTRICAL COMPANIES' SHARES

Prices, Dividends and Yields

Company	1939 High-est	1939 Low-est	Dividend Pre-vious	Dividend Last	Price Aug. 22	Rise or Fall	Yield £ s. d.
Home Electricity Companies							
Bournemouth and Poole	68/3	63/9	15	15	62/6xd.	—	4 16 0
British Power and Light	30/9	26/–	7	7	27/6	–1/–	5 1 10
City of London	33/9	31/–	7½	7½	30/–xd.	—	5 0 0
Clyde Valley	37/9	34/–	8	8	36/3	–⅛	4 8 4
County of London	46/9	41/9	10½	10½	42/–	–1/6	5 0 0
Edmundson's :							
7% Pref.	31/6	30/–	7	7	30/–	—	4 13 4
Ord.	27/9	23/–	9	6	25/–	–6d.	4 13 2
Elec. Dis. Yorkshire	41/6	37/9	9	9	38/9	—	4 16 9
Elec. Fin. and Securities	47/9	45/–	12½	12½	47/6	—	5 5 3
Elec. Supply Corporation	51/9	47/6	12	12	47/–	–6d.	5 2 1
Isle of Thanet	20/–	18/6	4	4	18/6	—	4 6 6
Lancs Light and Power	34/6	29/–	7½	7½	31/3	—	4 16 0
Llanelly Elec.	22/6	21/–	5½	5½	21/–	—	5 4 6
Lond. Assoc. Electric	30/–	25/–	7	7	25/–	—	5 12 0
London Electric	34/3	32/–	7	7	32/6	—	4 6 2
London Power Deb. Red.	106½	102	5	5	102xd.	—	4 18 2
Metropolitan	51/–	45/3	12	12	46/3	—	5 4 0
Midland Counties	38/9	34/–	8	8	38/9	+⅛	4 2 6
Mid. Elec. Power	41/9	38/3	8	9	39/6	—	4 11 2
Newcastle Elec.	28/9	26/6	7	7	27/–	—	5 3 8
North Eastern Electric :							
Ordinary	32/3	28/6	7	7	30/6	—	4 11 10
7% Pref.	32/6	30/–	7	7	31/–	—	4 10 4
Northampton	48/–	45/–	10	10	46/3xd.	—	4 6 7
Notting Hill 6% Pref. (£10)	13¾	12¾	6	6	12¾	—	4 14 1
Northmet Power :							
Ordinary	46/6	41/6	10	10	43/3	—	4 12 6
6% Pref.	29/–	27/–	6	6	27/–	—	4 9 3
Richmond Elec.	29/–	26/3	7	7	26/3xd.	—	5 6 10
Scottish Power	38/9	33/9	8	8	35/–	–⅛	4 11 5
Southern Areas	22/9	19/6	5	5	19/6	–6d.	5 2 7
South London	30/9	28/–	7	7	26/6	—	5 5 8
West Devon	23/3	22/6	5	5	22/6	—	4 9 0
West Glos.	21/3	18/–	2	2½	18/6	—	2 14 1
Yorkshire Elec.	38/6	34/9	8	8	35/6	–2/–	4 11 4
Overseas Electricity Companies							
Atlas Elec.	4/3	2/–	Nil	Nil	2/6	—	—
Calcutta Elec.	39/–	29/–	10*	10*	29/6	–6d.	—
Cawnpore Elec.	34/6	28/3	10	10	28/3	—	7 1 7
East African Power	26/3	22/–	7	7	22/–	–6d.	6 7 5
Jerusalem Elec.	24/6	23/–	7	7	23/–	—	6 1 9
Kalgoorlie (10/–)	10/6	9/6	7½	7	10/3	—	7 6 4
Madras	31/–	21/3	8*	8*	21/3	—⅛	—
Montreal Power	35½	31	1½	1½	34	–½	—
Palestine Elec. "A"	29/6	21/3	7½*	5*	21/3	—	4 14 2
Perak Hydro-electric	18/9	15/–	7	6	15/9	—	7 12 4
Shawinigan Power	23½	20	85cts.	83cts.	21½	—	—
Tokyo Elec. 6%	61	38	6	6	37½	–1	16 0 0
Victoria Falls Power	73/9	60/–	12½	15	67/6	–3/9	4 9 0
Whitehall Investments Pref.	19/6	16/–	7½	7½	16/–	–1/–	9 7 6
Public Boards							
Central Electricity :							
1950–70	112	105½	5	5	105½	–2½	4 14 7
1955–75	115½	108	5	5	109½	–2	4 11 4
1951–73	106½	103½	4½	4½	103½	–1	4 7 0
1963–93	95½	86	3½	3½	86½	–4	4 1 0
London Elec. Trans. Gtd.	88½	84	2½	2½	85½	—	2 18 6
London & Home Counties							
1955–75	107½	105	4½	4½	106½	—	4 4 6
Lond. Passenger Transport :							
A	114½	104½	4½	4½	104½	–2	4 6 2
B	117½	103½	5	5	103½	–2	4 16 9
C	83½	64½	4½	4	66½	–4	6 0 4
West Midland Joint Elec., 1948–68*	112½	108½	5	5	108½	—	4 12 2
Telegraph and Telephone							
American Tel. & Tel.	180	159	9	9	172½	–5	5 4 4
Anglo-Am. Tel. :							
Pref.	101½	89½	6	6	92½	–½	6 9 9
Def.	23⅝	19	1½	1½	21	—	7 2 10
Anglo-Portuguese	24/–	19/9	8	8	20/9	—	7 14 2
Cable & Wireless :							
5½% Pref.	95½	75	4½	5½	85	–2½	6 9 5
Ord.	55	34	4	4	47½	–3½	8 8 6
Income	100	95½	—	—	97½	—	4 2 1
Canadian Marconi $1	5/6	3/9	—	Nil	4/6	–3d.	—
Globe Tel. & Tel. :							
Ord.	31/3	23/6	7½*	7½*	30/–	—	5 0 0
Pref.	26/9	23/3	6	6	25/–	—	4 16 0
Great Northern Tel. (£10)	38	27½	20	20	28	–1	7 7 10
Inter. Tel. & Tel.	10½	6⅛	Nil	Nil	6¼	–⅛	—
Marconi-Marine	30/–	23/–	7½	10	27/6	—	7 5 6
Oriental Telephone Ord.	2½	46/3	12*	12*	2 7/16	—	4 16 0
Radio Corpn.	8⅞	5¾	8	6	5¾	–⅛	—
Telephone Props.	14/–	12/9	5	6	13/9	—	8 14 6
Telephone Rentals (5/–)	10/–	8/6	10	10	9/3	—	5 8 1
Western Union	28	19½	2⅛	—	23½	–4	—
Traction and Transport							
Anglo-Arg. Trams :							
First Pref. (£5)	7/6	3/6	Nil	Nil	5/–	—	—
4% Inc.	16	7	Nil	Nil	9	—	—
British Electric Traction :							
Def. Ord.	1025	700	5	5	875	—	—
Pref. Ord.	164	155	8	8	155	—	5 3 3
Bristol Trams	52/6	37/3	8	10	48/9	–⅛	4 2 0
Brazil Traction	13	7⅞	$1	50c.	8	–⅛	—
Calcutta Trams	25/6	22/–	8	8	24/–	—	6 13 4
Cape Elec. Trams	18/–	16/9	5	6	17/6	—	6 17 2
Lancs Transport	37/9	32/6	10	10	36/–	–1/–	5 11 1
Mexican Light :							
1st Bonds	25	21	5	5	25	—	—
Rio 5% Bonds	81	47	5	5	67	—	7 9 3
Southern Rly :							
5% Prefd.	75½	48	5	5	58	–5	8 12 4
5% Pref.	90½	80	5	5	82	–6½	6 2 0
T. Tilling	2½	39/6	10	10	47/–xd.	—	4 5 2
Tilling & B.A.	54/6	50/–	10	9*	53/9	—	3 7 0
West Riding	37/9	31/3	10	10	36/3	—	—
Equipment and Manufacturing							
Aron Electricity Ord.	32/3	28/9	15	15	30/–	–⅛	10 0 0
Assoc. Elec. :							
Ord.	45/3	34/9	10	10	38/–	–3/–	5 5 3
Pref.	36/6	34/–	8	8	35/–	—	4 11 5
Automatic Telephone & El.	47/6	39/3	10	12½	45/9	–1/9	5 9 3
Babcock & Wilcox	48/–	37/–	10	12½	45/–	–2/–	5 11 1
British Aluminium Ord.	58/9	48/9	12½	12½	55/–	–3/3	4 11 0
British Insulated Ord.	88/–	77/–	20	20	83/9	—	4 15 10
British Thermostat (5/–)	16/–	12/–	18½	18½	13/9	—	6 14 7
British Vacuum Cleaner (5/–)	22/6	14/–	40	40	15/–	—	—
Brush Ord.	5/9	4/6	Nil	Nil	5/–	—	—
Callender's	92/–	60/–	20	15	61/3	–½	4 18 1
Chloride Elec. Storage	82/3	62/6	20	15	3⅛	—	4 10 4
Consolidated Signal	96/–	80/9	36½	36½	82/6	—	8 16 9
Crabtree (10/–)	25/6	21/6	17½	17½	22/6	—	7 15 4
Crompton Parkinson :							
Ord. (5/–)	21/–	14/9	12½	15	18/9	–9d.	—
E. K. Cole (5/–)	9/–	4/–	10	Nil	5/3	–9d.	—
Elec. & Musical Industries (10/–)	14/9	8/9	10	5	9/–	–9d.	5 11 1
Electric Construction	38/6	30/6	12½	13½	35/–	—	7 14 3
Enfield Cable Ord.	58/6	48/6	25	16½	48/9	—	6 6 7
Electrical Switchgear (10/–)	27/–	23/9	16	16	23/9	—	6 14 9
English Electric	36/6	30/3	10	10	33/6	–½	5 19 5
Ensign Lamps (5/–)	16/9	13/9	—	25	16/9	—	7 9 2
Ericsson Tel. (5/–)	43/–	35/–	25*	25*	41/3	—	3 0 8
Ever Ready (5/–)	24/–	18/6	35	30	18/6	–6d.	8 2 2
Falk Stadelmann	27/–	18/9	10	6	20/–	—	6 0 0
Ferranti Pref.	25/6	22/6	7	7	23/–	—	6 1 9
G.E.C. :							
Pref.	31/9	29/3	6½	6½	31/3	—	4 3 2
Ord.	82/–	70/9	17½	20	73/–	–1/6	5 7 6
Greenwood & Batley	27/6	24/6	7	15	26/3	—	11 9 0
Hall Telephone (10/–)	22/3	19/3	15	15	20/–	—	7 10 0
Henley's (5/–)	21/–	17/3	20	20	17/6	–⅛	5 14 3
4½% Pref.	23/–	21/–	4½	4½	21/3	—	4 4 8
Hopkinsons	46/3	37/3	12½	15	45/–	—	6 13 4
India-Rubber Pref.	21/3	20/–	5½	5½	20/–	—	5 10 0
Intl. Combustion	120/–	97/–	32½	32½	5¾	–⅛	5 12 10
J. Lucas	60/–	52/–	15	15	60/–	—	5 0 0
Johnson & Phillips	41/3	32/–	12½	12½	38/9	–⅛	6 8 10
Lancashire Dynamo	68/–	57/6	25	25	60/–	–½	8 6 8
Laurence Scott (5/–)	12/–	10/–	15	15	10/3	—	7 6 4
London Elec. Wire	31/6	28/6	12	7½	28/9	—	5 4 4
Mather & Platt	50/–	42/6	13½	13½	43/9	—	6 3 3
Metropolitan Elec. Cable Pf.	21/3	21/–	5½	5½	21/3	—	5 3 6
Murex	85/9	63/9	20	20	75/–	–⅛	5 6 6
Pye Deferred (5/–)	13/9	7/6	25	25	8/–	–3d.	15 12 6
Revo (10/–)	35/6	29/–	17½	17½	28/–	—	6 5 0
Reyrolle	61/–	52/6	12½	12½	56/3	—	4 9 0
Siemens Ord.	26/9	20/6	7½	7½	22/6	–⅛	6 13 4
Strand Elec. (5/–)	5/6	3/9	5	10	3/9	—	3 6 8
S. Smith (1/–)	9/9	6/–	37½	50	8/9	—	5 14 4
Switchgear & Cowans (5/–)	15/–	11/3	20	20	12/–	—	8 6 8
Telegraph Condenser (10/–)	7/6	5/–	5	—	7/6	—	—
Telegraph Construction	2½	37/6	10	10	38/9	—	5 3 1
Telephone Mfg. (5/–)	10/–	8/–	9	9	9/3	—	4 17 3
Tube Investments	91/–	82/9	23¾	23¾	87/6	–½	5 10 7
Vactric (5/–)	4/3	2/3	10	4	2/3	—	8 18 0
Vickers (10/–)	24/6	16/3	10	10	16/6	–1/6	6 1 3
Ward & Goldstone (5/–)	22/6	19/6	20	20	19/9	—	5 1 3
Westinghouse Brake	54/9	43/9	17½	17½	47/6	–½	7 7 6
Walsall Conduits (4/–)	31/9	24/–	55	55	25/9	—	8 10 8
West, Allen (5/–)	7/6	5/9	7½	10	6/3	–3d.	8 0 0

* Dividends are paid free of Income Tax.

NEW PATENTS

Electrical Specifications Recently Published

Compiled by a firm of chartered patent agents. The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (1s. *each*) *can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2.*

1937

28517. "Electric cables." Allgemeine Elektricitäts Ges. October 19th, 1936. (510002.)

28761. "Capacity-controlled devices or systems involving the use of a thermionic valve or electron current." J. Cochrane. October 21st, 1937. (509922.)

29092. Electron - discharge valve arrangements for producing negative resistance effects." Telefunken Ges. für Drahtlose Telegraphie. October 24th, 1936, (510180.)

34738. "Means for operating electric induction furnaces from static current convertors." Allmanna Svenska Elektriska Aktiebolaget. December 19th, 1936. (510005.)

35462. "Electric systems for the control of tools or the like in industrial processes." J. Bergier, A. Eskenazi and V. Gavronsky. December 24th, 1936. (510006.)

35658. "Electric cable." British Insulated Cables, Ltd., B. Welbourn, F. J. Brislee, L. Macfarlane and J. Lyon. December 23rd, 1937. (510008.)

1938

2164/5. "Electrical means for the automatic control of speed." T. B. Somerville and Metropolitan-Vickers Electrical Co., Ltd. January 22nd, 1938. (Addition to 478681.) (510314/5.)

2408. "Telecommunication systems." Standard Telephones & Cables, Ltd., and E. P. G. Wright. January 25th, 1938. (510012.)

2411. "Electro-magnetic relays." Standard Telephones & Cables, Ltd. January 25th, 1938. (510160.)

2434. "Illuminated display devices." C. W. Hobson. January 25th, 1937. (510015.)

2435. "Remote electrical control systems." British Thomson-Houston Co., Ltd., and A. L. Whiteley. January 25th, 1938. (509931.)

2500. "Electric contactors having arc extinguishing means." Allen West & Co., Ltd., and C. Johnson. January 26th, 1938. (509932.)

2525. "Ticket-issuing device for attachment to a manually operated or electrically driven liquid measurement pump." H. Jermyn. January 26th, 1938. (509934.)

2532. "Illuminated signs." British Thomson-Houston Co., Ltd., and G. S. C. Lucas. January 26th, 1938. (510319.)

2549. "Apparatus for magnetically testing work pieces, especially seam welds." Siemens & Halske Akt.-Ges. January 26th, 1937. (510094.)

2570. "Control of electric series-wound motors." R. Bosch Ges. January 30th, 1937. (510161.)

2571. "Electric storage batteries." R. Bosch Ges. February 5th, 1937. (510238.)

2636. "Ignition magnetos for internal-combustion engines." Bendix Aviation Corporation. January 30th, 1937. (510169.)

2660. "Telekinematographic and like apparatus." Baird Television, Ltd., and T. C. Nuttall. January 27th, 1938. (510171.)

2760. "Electric-light fittings." C. W. C. Moore. January 28th, 1938. (509936.)

2827. "Control systems for synchronous machines." British Thomson-Houston, Co., Ltd. January 29th, 1937. (510327.)

2871. "Multiple meter device." Metrawatt Akt.-Ges. Fabrik Elektrischer Messgerate. April 6th, 1937. (510251.)

2905. "Control systems for synchronous motors." British Thomson-Houston Co., Ltd. January 29th, 1937. (510176.)

2916. "Prepayment electricity and other like meters." Chamberlain & Hookham, Ltd., and S. James. January 29th, 1938. (509939.)

3025/6. "Electron-discharge devices." Marconi's Wireless Telegraph Co., Ltd. January 29th and 30th, 1937. (510265/6.)

3036. "Electric motor control systems." British Thomson-Houston Co., Ltd. January 30th, 1937. (510336.)

3055. "Locks and Keys, also applicable to electric switches." H. J. Buchanan Wollaston. February 1st, 1938. (Cognate applications 31529/38 and 33145/38.) (510179.)

3182. "Apparatus for use in testing thermionic valves." J. F. Everett, and Automatic Coil Winder & Electrical Equipment Co., Ltd. February 2nd, 1938. (510098.)

3439. "Junction boxes for electric cables." Callender's Cable & Construction Co., Ltd., and H. C. Bewers. February 3rd, 1938. (510184.)

3897. "Electric cables." Felten & Guilleaume Carlswerk Akt.-Ges. February 8th, 1937. (510190.)

4069. "Electrically heated ovens." General Electric Co., Ltd., and O. W. Humphreys. February 9th, 1938. (510191.)

7961. "Electro-mechanical devices for recording and reproducing sound oscillations on an endless film." Reterson Holding Soc. Anon. March 16th, 1937. (510204.)

9414. "Electric tumbler switches." Wandsworth Electrical Manufacturing Co., Ltd., and T. Batchelor. March 28th, 1938. (510211.)

9720. "Arc control devices for electric circuit-breakers." General Electric Co., Ltd., and C. J. O. Garrard. March 30th, 1938. (510030.)

9897. "Ignition systems." British Thomson-Houston Co., Ltd., and G. E. Fardon. March 31st, 1938. (510213.)

11209. "Electric condensers and the manufacture thereof." British Insulated Cables, Ltd., F. J. Brislee, B. Welbourn, H. Higham and J. C. Quale. April 12th, 1938. (509948.)

11271. "Testing devices for electrical apparatus." General Electric Co., Ltd., and S. T. Palmer. April 13th, 1938. (510032.)

12356. "Compression struts for electrical apparatus." British Thomson-Houston Co., Ltd., and W. S. Adams. April 25th, 1938. (510102.)

14210. "Indicating and/or recording arrangements employing cathode-ray tubes." W. Holzer and G. Schwarz. May 12th, 1937. (510216.)

14320. "Electric-discharge devices." M-O Valve Co., Ltd., and J. H. Phillips. May 13th, 1938. (510103.)

16186. "Automatic switches or circuit-breakers." J. A. Crabtree & Co., Ltd. (Schiele Industriewerke). May 31st, 1938. (510105.)

16191. "Thermally-sensitive trips for electric switches." J. A. Crabtree & Co., Ltd. (Schiele Industriewerke). May 31st, 1938. (510106.)

16417. "Gas-blast electric circuit-breakers." Akt.-Ges. Brown, Boveri & Cie. October 30th, 1937. (Addition to 492944.) (509955.)

19145. "Acoustic treatment of rooms or halls." Standard Telephones & Cables, Ltd. August 19th, 1937. (510109.)

20091. "Low-frequency induction melting furnace for metals and metal alloys. Vereinigte Deutsche Metallwerke Akt.-Ges. Zweigniederlassung Basse & Selve. April 25th, 1938. (510291.)

20810. "Air-space insulated electric cables." Norddeutsche Kabelwerke Akt.-Ges. December 7th, 1937. (510295.)

21304. "Cross-talk measuring and correcting apparatus." Standard Telephones & Cables, Ltd. (Western Electric Co., Inc.). July 18th, 1938. (510296.)

21420. "Electric air-raid warning systems." Standard Telephones & Cables, Ltd. May 6th, 1938. (Addition to 495057.) (510050.)

21954. "Suction-cleaning device." H. W. Mettler. July 23rd, 1938. (510113.)

22434. "Electric welding apparatus." Linde Air Products Co. August 7th, 1937. (510116.)

24809. "Device for damping humming noises in electricity meters." Landis & Gyr Akt.-Ges. November 15th, 1937. (510119.)

25152. "Electric spot-welding apparatus" D. Sciaky. November 9th, 1936. (Divided out of 504346.) (509964.)

26085. "Rotary electric contact makers." Jaeger-Aviation. October 20th, 1937. (510059.)

26188. "Electrically heated salt melt bath." Deutsche Gold und Silberscheideanstalt Vorm. Roessler. September 14th, 1937. (Cognate application 26189/38.) (510060.)

27539. "Methods of coating metals." British Thomson-Houston Co., Ltd. September 22nd, 1937. (509965.)

28008. "Thermionic-valve circuits." Pye, Ltd., and M. V. Callendar. February 2nd, 1938. (Divided out of 490672.) (Cognate application, 18545/38.) (510301.)

28103. "Vehicles for toy electric railways." E. Voelk. August 5th, 1938. (510121.)

29386. "Locking devices for connecting elements, such as contact springs and the like on armatures of electric ignition apparatus." R. Bosch Ges. November 12th, 1937. (510218.)

33573. "Electrical connectors." E. Kramer. December 17th, 1937. (510305.)

36715. "Electric resistance elements and process of manufacturing same." Manufacture Générale Métallurgique. December 20th, 1937. (Cognate application 36716/38.) (510221.)

37852. "Connection arrangement in which relays lie in a balancing circuit comprising line and line balance, particularly for telegraph exchange apparatus." Fides Ges. für die Verwaltung und Verwertung von Gewerblichen Schutzrechten. January 25th, 1938. (510306.)

1939

1462. "Manufacture of electric dry cells." Burndept, Ltd., and J. O'Dwyer. January 16th, 1939. (509996.)

1755. "Ultra-short wave oscillation generators." Telefunken Ges. für Drahtlose Telegraphie. February 5th, 1938. (510226.)

3399. "Method of constructing stratified electrode systems." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. February 4th, 1938. (510141.)

13604. "Electron-multiplier tubes." Mullard Radio Valve Co., Ltd. May 9th, 1938. (510232.)

TRADE MARK APPLICATIONS

THE following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from August 16th:—

Lewcoglass. No. 605798. Class 9 (IV). Electric wires and cables, all being insulated with glass.—The London Electric Wire Co. and Smiths, Ltd., 24, Queen Anne's Gate, Westminster, S.W.1.

CondITLe. No. 606354. Class 9 (IV). Automatic apparatus for controlling successive connections in electrical apparatus at correct intervals.—Igranic Electric Co., Ltd., 147, Queen Victoria Street, E.C.4.

CHFM (lettering and design). No. 604851. Class 10 (IV).—X-ray apparatus and parts thereof.—C. H. F. Muller Gesellschaft, Hamburg, Germany. (British representatives: Dicker, Pollak, Mercer, Tench and Meyer, 20-23, Holborn, E.C.1.)

Delta. No. 601179. Class 11 (IV). Ordinary translucent electric lamps of the bulb type.—La Société Lampe Delta, Brussels, Belgium. (British representatives: Cope & Co., 65, Victoria Street, Westminster, S.W.1.)

Epic. No. 605340. Class 11 (IV).—Electric lamps for ordinary illumination.—Rival Lamps, Ltd., 230-232, Knight's Hill, West Norwood, S.E.27.

N I Co. (lettering and design). No. 607419. Class 17 (IV).—Electrical insulators and insulating material.—The New Insulation Co., Ltd., 125, Bristol Road, Gloucester.

CONTRACT INFORMATION

Particulars of work for which tenders are invited, contracts placed, and building schemes promising work for electrical contractors and traders

Contracts Open

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses. Further details of items marked with an asterisk can be obtained from the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, London, S.W.1.

Argentina.—BUENOS AIRES.—October 2nd. Two pumping sets with switchboards, transformers, cable, &c. Argentine National Sanitation Department. (T.Y. 25937/39.)*

September 5th. Electric pumping set accessories and spares. (T.Y. 18583/39.)*

Australia. — MELBOURNE. — September 12th. Posts and Telegraphs Department. Telephone equipment, comprising filters, indicators, terminal equipment, loading coils, &c. (T. 25398/39.)*

September 19th. Automatic telephone switching equipment. (T. 25751/39.)*

September 19th. Telephone and telegraph cable. (T. 25750/39.)*

September 26th. Automatic generator voltage regulators. (T. 25902/39.)*

September 26th. Telephone transformers. (T. 26136/39.)*

December 12th. State Electricity Commission of Victoria. Two 12,000-kW water-driven turbo-generators and accessory plant. (T. 25686/39.)*

BRISBANE.—September 12th. City Electric Light Co., Ltd. Four 750-kVA transformers. (T. 25376/39.)*

October 11th. Electrically driven pumping unit comprising pump, motor, discharge column in well, shafting and control gear, &c. Department of Irrigation, Water Supply Sewerage, Executive Building, George Street, Brisbane. (T. 26172/39.)*

Barrhead.—September 14th. Town Council. Sewage purification works, &c. Forms from Leitch & Sharpe, 65, Bath Street, Glasgow, C.2 (deposit £2 2s.). Tenders to Town Clerk.

Belfast.—September 1st. Electricity Department. 33-kV and 6.6-kV switchgear and interconnecting cables, and AC motors and wiring to replace DC installations at consumers' premises. (August 18th.)

Birmingham.—September 8th. Electric Supply Department. One 12-panel, 11,000-V, 250-kVA duplicate busbar metal-clad switchboard. Coal-handling plant and ash-disposal plant at Hams Hall "B" power station. (August 11th.)

Bristol.—September 6th. Electricity Department. E.h.v. switchgear, l.v. substation switchgear, and 6.6-kV and 11-kV transformers. (August 18th.)

September 5th. Corporation. Installation of electrical services in the clinics at Southmead Hospital. (August 18th.)

Dover.—September 1st. Borough Council. Material for change-over in Whitfield area. (August 18th.)

Dunfermline.—August 28th. Town Council. Electric lighting in 191 houses at Brucefield. Schedules from C. R. Douglas & Son, 15, East Port, Dunfermline. Tenders to Town Clerk (deposit £1 1s.).

East Grinstead. — September 6th. U.D.C. Cables for twelve months. (See this issue.)

Edinburgh. — September 1st. H.M. Office of Works, 122, George Street. Erection of telephone repeater station. Schedules from Office of Works architect (deposit £1).

Egypt.—CAIRO.—September 30th. Four pumps for Kafr El Elw Central power station. Tanzim Department, Ministry of Public Works. (T. 26146/39.)*

October 18th. Extension of the electrical network at Damietta. Municipalities Department. (T. 26152/39.)*

September 21st. Supply, delivery and erection of equipment for extension of electric light installation at Minieh. (T. 26151/39.)*

High Wycombe.—September 8th. Town Council. Wiring and new fittings at town hall. Specifications from borough surveyor, Municipal Offices.

India.—NEW DELHI.—November 28th. Indian Stores Department, Electrical Section. DC ceiling fans. (T. 25344/39.)* AC ceiling fans. (T. 25345/39.)*

June 9th, 1940. AC and DC table fans. (T. 35343/39.)*

SIMLA.—September 14th. Indian Stores Department, Electrical Branch. Bare copper conductors. (T. 25927/39.)*

September 14th. Three-single operator DC arc welding generators, rated 250 A, and two 12/14 BHP Diesel oil engines. (T. 26131/39.)*

September 7th. Condensers (50 kVA) for power factor correction, one p.f. meter and three 22½-kW motor-generator sets with control gear. (T. 26180/39.)*

Iraq.—BAGDAD.—October 24th. Central Foreign Purchasing Board. Underground cables and accessories. (T. 25439/39.)*

Kirkcaldy.—September 9th. Automatic fire-fighting installation. (See this issue.)

Lincoln.—August 28th. North Lindsey Water Board. Pilot cable from Scotney Farm and Winterton Holmes to Sawcliffe Reservoir. (August 11th.)

Manchester. — September 7th. Electricity Committee. Two switchgear operating batteries and charging equipment. (See this issue.)

September 21st. Switchgear busbar protective equipment. (See this issue.)

Newport (MON).—September 11th. Electricity Department. One turbine-driven and two motor-driven boiler feed pumps. (See this issue.)

New Zealand.—WELLINGTON.—September 19th. Public Works Department. Two three-phase oil circuit-breakers, each having a rupturing capacity of 250,000 kVA at 33-kV, complete with accessories. (T. 25365/39.)*

October 3rd. Four single-phase potential transformers. (T. 25363/39.)*

October 17th. 50-kV outdoor switchgear and steelwork, complete with all necessary insulators and accessories for Maungatapere sub-station. (T. 25364/39.)*

October 24th. Mimic bus control panels complete with steel frames, panel fixing bolts, labels, instruments, control switches, indicators and terminal boards. (T. 25360/39.)*

September 5th. One Diesel-driven lighting plant. (T. 25832/39.)*

September 21st. Metal-cased condensers. (T. 25604/39.)*

October 24th. One 110-kV, three-phase, outdoor isolating switch. (T. 25830/39.)*

October 24th. 11,000-V switchgear and associated equipment. (T. 25831/39.)*

November 14th. Supply of 50-kV, three-phase, outdoor switchgear and steelwork with insulators and accessories. (T. 26179/39.)*

September 20th. 60,000 porcelain or composition insulators. Stores Division, General Post Office, Wellington, C.1. (T. 25828/39.)*

Nottingham.—September 21st. Corporation. Insulated food trolleys for the city hospital. (August 18th.)

County Council. Contractors desirous of tendering for the electrical installation at the new county hall and offices must send their names and addresses by September 2nd. (August 18th.)

Reigate.—August 31st. Corporation. Rewiring of the electrical installation at headquarters fire station. (August 18th.)

Salford.—August 28th. Corporation. Sodium street lamps. (August 18th.)

September 6th. Corporation. Fire extinguishing plant and transformers. (See this issue.)

Shipley.—September 6th. Electricity Department. Cables for twelve months. (See this issue.)

South Africa. — JOHANNESBURG. — August 31st. Union Tenders and Supplies Board. One 50-kVA transformer and high- and low-voltage switchgear. (T. 25350/39.)*

September 9th. City Council. Copper conductors. (T. 25656/39.)*

September 13th. Seven cable test sheath fault detector panels. (T.Y. 25662/39.)*

September 13th. Twelve 250-MVA and 24 150-MVA metal-clad, triple-pole, oil-immersed circuit-breakers. (T. 25985/1939.)*

September 16th. Trolley-bus overhead equipment. (T. 26113/39.)*

CAPE TOWN.—August 30th. Electricity Supply Commission. Pole fittings, including line, tension and angle cross-arms, earth wire clamps and galvanised steel wire. Pin type and suspension strain insulators. (T. 25642/39.)*

November 17th. 33-kV switchgear and auxiliary plant. (T. 25663/39.)*

PRETORIA.—September 14th. Public Works Department. Transformers and switchgear. (T.Y. 25882/1939.)*

September 7th. Union Tender & Supplies Board. Seventy-two floodlights for hangar lighting at various centres. (T. 25653/39.)*

September 7th. Architectural lamps. (T. 25647/39.)*

September 14th. Motors and switches, rectifier, drum controller and grid resistance starter. (T. 26125/39.)*

PIETERMARITZBURG. — September 6th. Electric cooking apparatus and food mixer. (T. 25648/39.)*

NATAL. — September 6th. Electric laundry machinery, cooking and food preparation equipment and refrigerator. (T.Y. 25664/39.)*

Stockton.—September 1st. A.R.P. Committee. Labour and materials for lighting Chestergate air raid shelter. (180 points.) Tenders to Chairman, A.R.P. Committee, c/o borough surveyor.

Stoke-on-Trent.—September 13th. North West Midlands J.E.A. Three transformer kiosks. (August 18th.)

Swinton and Pendlebury. — August 28th. Electricity Department. Distribution transformers. (August 18th.)

West Ham.—September 4th. Electricity Department. V.i.r. and tough rubber-sheathed wires and cables for twelve months. (August 11th.)

Orders Placed

Aberdeen.—Town Council. Accepted. Electrical work (£625) at 80 houses at Middlefield.—A. Knight.

Bathgate.—Town Council. Accepted. Lighting installations at 56 houses.—W. Young, Bothwell.

Bedlington.—Urban District Council. Accepted. Electrical installations in 70 houses, Church Lane estate.—A. R. Hudson.

Chesterfield.—Electricity Committee. Accepted. Economiser (£490).—Clay Cross Co., Ltd.

Dundee.—Institute of Art and Technology. Accepted. Electrical work at Duncan of Jordanstone College (£83,932).—Lowdon Bros. & Co., Ltd. Heating.—G. N. Haden & Son, Ltd. Automatic stoker.—Mirrlees, Bickerton & Day, Ltd.

Durham.—County Health Committee. Accepted. Electrical installation at School, Aycliffe mental colony (£2,200).—Cox & Walkers, Ltd.

County Education Committee. Accepted. Electrical works at schools:—Birtley school (£137).—B. L. Oliver. Crook school (£935).—Falconer, Cross & Co., Ltd. Welfield school (£106).—Brantingham Bros. Bishop Auckland school (£124).—R. Robson.

Isle of Ely.—County Council Mental Deficiency Committee. Accepted. Electrical installation at Kingswood Park Colony (£1,738).—N. G. Bailey & Co., Ltd.

Glasgow.—Health Committee. Accepted. Nineteen lifts at Stobhill Hospital (£12,952).—Waygood-Otis, Ltd.

Streets Committee. Accepted. Controller for traffic signals (£232).—Automatic Telephone and Electric Co., Ltd.

Transport Committee. Accepted. Cables.—Craigpark Electric Cable Co., Ltd.

Kidderminster. — Worcester County Council. Accepted. Electrical installation at nurses' home (£655).—Abell & Smith's Electrical Co., Ltd.

Leicester.—Accepted. Genatosan, Ltd.—Installation of electric lighting and power (£10,000).—The Electrical Equipment Co., Leicester, Ltd.

Methil (FIFE).—Accepted. Electrical work at Methil Church.—Miller & Stables.

Northumberland.—Health Committee. Accepted. Electrical work at Wooley sanatorium (£661).—A. Moffett & Sons.

Contracts in Prospect

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Aberdeen. — Rebuilding Nazareth House (£14,000); R. L. Rollo, architect, Camloun, Cults.

Acton.—Extensions to works, The Steyne, for C.W.S., Ltd.; L. G. Ekins, architect, 99, Leman Street, Whitechapel, E.1.

Batley.—Shops, offices and business premises, Commercial Street; H. L. Hall, architect, 4, Brunswick Street.

Bellingham (NORTHUMBERLAND). — School evacuation camp, for the National Camps Corporation; W. and T. R. Milburn, architects, 17, Fawcett Street, Sunderland.

Bedlington.—Cinema, Guide Post, for S. Carr; Marshall, Tweedy and Bourn, architects, Grainger House, Blackett Street, Newcastle-on-Tyne.

Bellshill.—Cinema, Main Street, for Clydesdale Cinemas, Ltd.; J. M. Hamilton, architect, Strathaven.

Birmingham. — Factory, Parliament Street, for C. and S. Cox. Extensions to heat treatment department, Hay Hall Road, Yardley, for the Rover Co., Ltd.

Blackpool.—Houses (25) and bungalows, Valeway Avenue and Lockerbie Avenue, Cleveleys; A. A. Holt, builder, Beach Road, Cleveleys. Nurses' home, Whinney Hey Hall (£27,000), for Blackpool Victoria Hospital,

Bournemouth. — Café, Overstrand (£11,991); James Drewitt & Son.

Brampton (CUMBERLAND). — Houses (36), for the R.D.C.; surveyor, 5, Victoria Place, Carlisle.

Brighouse.—Alterations to Mill House, with electrical work, for T.C.; borough engineer, Commercial Street.

Brighton.—Hospital block (£30,000), for Royal Sussex County Hospital Committee; J. L. Denman, architect, 27, Queen's Road.

Bromley.—Additions to factory, Ashgrove Road; Utility Chemical Co., Ltd.

Bromsgrove.—Houses (42), junction of Redditch Road and Alvechurch Road; J. Hornick, builder, 21, Cannon Hill Road, Birmingham, 12.

Campbeltown.—Houses (35), Carlton; Scottish Special Areas Housing Association, Ltd., Chandwick Place, Edinburgh.

Cardiganshire. — County school for girls, Penglais Road, Aberystwyth, for the E.C.; J. Lewis-Evans, architect, Aberystwyth.

Chesterfield.—Factory, Sheffield Road, for Robertson & Woodcock, Ltd., Trebor works, Katherine Road, London, E.7; Wilcockson & Cutts, architects, 12, Saltergate, Chesterfield.

Colchester.—Large extensions to printing works, Hythe, for Spottiswoode & Co., Ltd.

Coventry. — Houses (29), Ashington Grove; James & Edwards, 141, Spon Street. Houses (48), Hipswell Highway; F. C. W. Blockley, Roman Road. Houses (33), Keats Road; A. E. Simmons, Hollow Farm estate, Radford Road. Houses (31), Shorncliffe Road and Tarlington Road; E. J. Sutton, Cornerways, Beechwood Avenue. Houses (23), with shops, Ansty Road, Sommerville Road and Morris Avenue; A. E. White, Ansty Road, Wyken.

Croydon.—Nurses' home, Mayday Hospital, Thornton Heath, for T.C.; E. Taberner, town clerk, Town Hall.

Darlington.—Physical training, sports and recreation centre, Baydale Farm; E. Minors, borough engineer, Town Hall, Darlington. Elementary school, Western area, for the E.C. R.C. senior school; Rev. F. Wilkinson.

Durham.—Secondary school, Gilliland (£56,300); G. W. Lazenby & Co., Ltd., Ferryhill.

East Retford.—Junior school, for the E.C.

Eire (KILKENNY). — Dwellings (54), Kells Road and Waterford Road, for T.C.; M. Bourke, acting borough surveyor, Kilkenny.

Haltwhistle.—Extensions to works, for the Tyne Fireclay Co., Ltd.; A. Bell, builder, 357, Old Durham Road, Gateshead.

Hexham. — Welfare centre (£3,183); Middlemiss Bros., Ltd., Newcastle.

Heywood. — Fireman's dwellings (£7,500), York Street, with electrical work, for T.C.; borough surveyor.

Hillingdon.—Senior school, near Long Lane, for R.C. Authorities; E. A. Remnant, architect, 10, Gray's Inn Square, W.C.1.

Isle of Ely.—Police quarters, March (£15,588); county architect. Junior school, Whittlesey, for the County E.C.

Kesteven.—Senior school, Hykeham, for the E.C.

Lancashire.—School, Lowton (£36,877), for the County E.C.

Leeds.—Church of St. Nicholas, schools and presbytery, Gipton estate (£30,000), for R.C. Authorities.

Leicester.—Cinema, Mere Road; O. Ogden, 18, Millstone Lane.

Leigh.—Houses (250), Common Lane site; T. A. Clare, borough surveyor.

London (POPLAR).—Large extensions to factory, Leven Road, for Milns, Cartwright & Reynolds, Ltd.; Alfred & Vincent Burr, architects, 85, Gower Street, W.C.1.

Malvern.—Senior school, Yates Hay Road; C.E. Authorities.

Mansfield.—Showroom and garage, Nottingham Road, for R. S. Beard & Co., Ltd., Debdale Garage, Mansfield Woodhouse; W. Richardson White, architect, 33, Albert Street, Mansfield.

Market Bosworth.—Fire station; Beck and Sons.

Middlesbrough.—Houses (14), Farndale Road; H. Halliman, builder, Middlesbrough. Houses, near Levick Crescent; L. W. Arnett, architect, 5, Houndgate, Darlington. Houses (10), Malvern Drive; T. Duncanson, builder, Acklam. Houses (24), Merlin Road, &c.; C. J. Boyd, Ltd., builders, 15, Emmerson Street, Linthorpe. Houses (42-acre site), Thorntree Farm estate; borough engineer.

Neath.—Houses (43), Resolven, for R.D.C.; J. T. Jones, engineer, 13, Orchard Street, Neath.

Newark.—Houses (28) and two streets, Winthorpe Road; R. Hustwayte, Fosse Road.

Newcastle-on-Tyne.—Houses (338), and bungalows, Blakelaw estate; R. G. Roberts, city architect, 18, Cloth Market. Extensions to bakery, Elswick Place, for the Newcastle Co-operative Society (£35,000); C.W.S. Building department, West Blandford Street.

Northampton.—Houses (40); H. Holloway & Son. Flats (44), Leicester Street and Nelson Street; R. A. Winfield, borough surveyor.

Northumberland.—Homes for aged Tweedmouth (£33,000) and nurses' home, Sanatorium, Wooley (£25,500), for the C.C.

Nottingham.—Large factory, Perry Road, Basford, for Bairns Wear, Ltd.; Evans, Clarke & Woollatt, architects, Wheeler Gate. Senior school, Sneinton Dale; Nottingham R.C. Diocesan Schools Commission.

Nottinghamshire.—Extensions to mental hospital (£18,530); W. J. Simms & Cooke, Ltd., Nottingham.

Oldham.—Central garage (£26,000), for T.C.; borough surveyor.

Ormskirk.—Extensions to hospital for the Board of Management of the Ormskirk General Hospital; F. W. Nicholson, architect, 2, Dewey Avenue, Aintree, Liverpool.

Orpington.—Fire station, Biggin Hill, for U.D.C.; Culliford & Partners, architects, 47, Essex Street, Strand, W.C.2.

Penzance.—Police headquarters and courthouse, adjoining Municipal Buildings, for T.C.; borough surveyor, Municipal Buildings.

Pershore.—Junior school (£10,675); T. A. Simpkins.

Radcliffe (LANCASHIRE).—Houses (28), Ainsworth; G. E. Wrigley, borough surveyor, Town Hall.

Redcar.—Extensions to public library, for the T.C.; T. Young and Co., builders, Redcar.

Rhyl.—Branch bank, High Street, for Martins Bank, Ltd., 7, Water Street, Liverpool, 2; James Tomkinson & Co., Ltd., contractors, Roscommon Street, Liverpool.

St. Andrews.—Cottages, Mental institution (£6,231); R. Carse & Son, Ltd.

Scarborough.—Houses (36); Burkinshaw and Woodcock, estate agents, York Place.

Sedgfield.—Cinema, Front Street; W. W. Turnbull.

Shaftesbury. — Dwellings (52), Lodbourne Farm site, Gillingham, for R.D.C.; L. Magnus Austin, architect, 1, West Borough, Wimborne, Dorset.

Sheffield.—Houses (38), Vauxhall Road and Tansley Street, and 30 at Highcliffe Drive; Ackroyd & Abbott, builders, 61, Studley Road, Attercliffe. Houses (26), and bungalows, Welbeck Road and Walkley Bank Road; J. Samuel, Walkley Bank Road, Owlerton. Motor engineering and body building workshops, Eldon Street, Chester Street, Dee Street and Devonshire Lane; Smith, Cooke, Son & Co., Ltd., Effingham Road, Sheffield, 4.

Shiney Row (CO. DURHAM).—Cinema; Corrigan and Hunter, contractors, Trentham Avenue, Benton, near Newcastle-on-Tyne.

Shoreham-by-Sea.—Cinema; R. A. N. Gammans, architect, Gresham House, 54, High Street.

Shropshire.—School, Donnington, for County E.C.

Solihull (WARWICKSHIRE).—Block of shops and flats, Streetsbrook Road; Bond, Smith & Co., 14, Hanover Square, London, W.1.

Southall.—Houses (43), Tentelow Lane; G. T. Crouch, Ltd. Extensions to bakery, Uxbridge Road; Price & Co., Ltd. Extension to factory, Uxbridge Road; T. Prosser Hingley, Ltd., Apex Works, Uxbridge Road.

Southwell.—Senior school, Lowes Wong (£39,980); C. H. Hill & Sons.

Staffordshire.—School, Newbolds estate, Wednesfield, near Wolverhampton, for C.C.; F. A. Hughes, director of education, County Education Offices, Stafford.

Stanmore.—Houses (40), Eaton Close, off Dennis Lane; G. Wimpey & Co., Ltd., 27, The Grove, Hammersmith, W.6.

Sunderland.—Houses (90), Ryhope and (14), Castletown, for the R.D.C.; L. W. Evans (Contractors), Ltd., 18, Norfolk Street, Sunderland. Conversion of premises, St. George's Square, into juvenile employment centre for the E.C.; J. M. Black, Ltd., builders, Grange Road, Jarrow-on-Tyne.

Surrey.—Schools, Abbotsbury Road, Morden (£56,253), Bletchingley, Milford, and Wrecclesham, for the County E.C.

Uxbridge.—Rebuilding laundry premises (£10,000), Rabbs Mill, Cowley Mill Road; W. S. Try, Ltd., builders, High Street, Cowley.

Wakefield.—Houses (24), Netherton, Crofton and Sharleston; W. E. Massie, engineer and surveyor, 18, St. John's North.

Wednesbury.—Houses (108), Brunswick Park estate; E. Smith & Son, Moorland Farm estate, Stone Cross.

Welwyn Garden City.—General hospital (£36,200), for U.D.C.; W. A. Pite, Son and Fairweather, architects, 12, Carteret Street, London, S.W.1.

West Riding.—School, Guiseley, for the County E.C.; Palkington & Enthoven, architects, 10, Bayley Street, Bedford Square, London, W.C.1. School, Wetherby, for the County E.C.; G. H. Shipley, architect, 53, Park Lane, Leeds.

Widnes.—Houses (209), off Birchfield Road, Pit Lane and Coroners Lane; Sutton Manor Collieries, Ltd., Bold, St. Helens.

Winchester.—Health centre, Guildhall, for T.C.; S. J. Bryant, quantity surveyor, 36, London Street, Basingstoke. Elementary school, Winchester-Petersfield Road, Chilcombe; Chancellor and Sawyer, architects, Queen Anne Chambers, Winchester.

Worcestershire.—Agricultural experimental station, Norton, for the C.C. Police station, Berrington Road, Tenbury; county architect. Senior school, Hagley; R.C. Authorities. Schools, Lickey, Tenbury and Upton-on-Severn, for the County E.C.

Yorkshire.—Extensions and alterations to the Council school, Reeth; J. W. White, County Hall, Northallerton.